Infrastructure Access and Subjective Well-Being: Exploring Gendered Effects Through the Capability Approach

Abstract:
This work examines the relationship between access to infrastructure, the development of individual capabilities, and subjective well-being, with a specific focus on gender differences. Drawing on the capability approach, we propose four hypotheses: (H1) access to each type of infrastructure improves subjective well-being through the enhancement of capabilities; (H2) infrastructure is more important for women than for men; (H3) the contribution of each infrastructure to the improvement of capabilities is greater for women than for men; and (H4) the level of each capability enabled by infrastructure is higher for women than for men. These hypotheses are tested using statistical tools on empirical data, and the results support all four propositions. The findings highlight the critical role of infrastructure in promoting gender-equitable development and enhancing individual well-being through capability expansion.

1. Introduction

Infrastructure has traditionally been analyzed within mainstream economics as a neutral and technical input for economic growth, productivity, and territorial competitiveness. Public investment has generally prioritized transport efficiency, industrial development, and market integration, while paying limited attention to how infrastructure shapes everyday life, social reproduction, and human well-being. As a result, infrastructure policy has largely been conceptualized as gender-neutral and universally beneficial, despite growing evidence that women and men experience urban environments, mobility systems, care services, and public spaces in profoundly different ways.

Recent international debates on well-being, sustainability, and social inclusion have increasingly challenged this perspective. Institutions such as the OECD, the United Nations, and the European Union have stressed the need to move beyond GDP-centerd approaches and adopt multidimensional frameworks capable of incorporating quality of life, social cohesion, health, environmental conditions, care, and subjective well-being into public policy evaluation (Stiglitz, Sen, & Fitoussi, 2009; OECD, 2020, 2023; UNDP,

2022). Within these debates, feminist economics has played a central role by demonstrating that conventional economic analysis systematically neglects the infrastructures and forms of social organization that sustain everyday life, particularly unpaid domestic and care work (Waring, 1988; Elson, 1995; Benería, Berik, & Floro, 2015).

In parallel, feminist urbanism and gender-sensitive planning have shown that cities and infrastructures are not neutral spaces but are deeply shaped by gendered divisions of labour, mobility, safety, caregiving responsibilities, and access to time and public services (Hayden, 1980, 1984; Horelli & Vepsä, 1994; Sánchez de Madariaga, 2004, 2013). This literature has progressively introduced the notion of infrastructure for everyday life, emphasizing that infrastructures such as childcare centers, hospitals, pedestrian areas, parks, public transport systems, markets, leisure facilities, and care services constitute essential conditions for sustaining well-being and social participation.

However, despite these advances, empirical research linking infrastructure, capabilities, subjective well-being, and gender remains limited. Existing studies have generally analyzed infrastructure from economic efficiency perspectives or have focused separately on subjective well-being, urban quality of life, or gender inequalities. Few studies have integrated these dimensions within a common analytical framework capable of explaining how infrastructure affects subjective well-being through the development of human capabilities, and even fewer have done so from a gender perspective.

This paper addresses this gap by proposing an integrated framework combining the Capability Approach and Subjective Well-Being theory to analyze the gendered impact of infrastructure on well-being. Specifically, the study conceptualizes infrastructure as an institutional conversion factor that enables or constrains the development of capabilities related to health, social relationships, education, care, labor market insertion, mobility, leisure, and emotions. In turn, these capabilities are expected to mediate the relationship between infrastructure access and subjective well-being.

The analysis forms part of the research project Infrastructure for Everyday Life from the Feminist Economics of Well-Being (Infraestructuras para la Vida Cotidiana desde la Economía Feminista del Bienestar), funded by the Spanish Ministry of Science, Innovation and Universities (PID2022-141305OB-I00). The project seeks to develop new

theoretical and methodological tools for evaluating infrastructure from the perspective of feminist economics, capabilities, and multidimensional well-being.

Empirically, the study is based on an original nationwide survey specifically designed within the framework of the project. The survey includes 1,502 interviews with the adult population residing in Spain and examines perceptions of access to infrastructure, the contribution of infrastructure to capability development, and subjective well-being outcomes. Unlike conventional infrastructure surveys focused on service provision or user satisfaction, this questionnaire was specifically constructed to capture how infrastructures affect multiple dimensions of everyday life and well-being from a gender perspective.

The paper advances four main hypotheses. First, it argues that infrastructure improves subjective well-being indirectly through the strengthening of capabilities. Second, it proposes that the positive effects of infrastructure on subjective well-being are greater for women than for men, due to women's greater structural dependence on proximity services, care infrastructure, and public transport systems. Third, it suggests that infrastructure contributes more strongly to the development of specific capabilities among women. Finally, it hypothesises that women report higher levels of capability enhancement associated with infrastructure access.

To test these hypotheses, the study employs mediation analysis using Structural Equation Modelling (SEM), allowing the examination of both direct and indirect effects between infrastructure, capabilities, and subjective well-being. In addition, gender interaction effects are analyzed to identify differentiated impacts between women and men.

By integrating feminist economics, the Capability Approach, subjective well-being theory, and infrastructure analysis, this paper contributes to several strands of literature simultaneously. First, it expands the study of infrastructure beyond productivity-centered approaches by situating infrastructure within the broader framework of everyday well-being. Second, it contributes to capability theory by operationalizing infrastructure as an institutional conversion factor. Third, it advances subjective well-being research by linking life satisfaction to material and institutional conditions. Finally, it contributes to gender-sensitive policy analysis by demonstrating that infrastructure investments are

neither neutral nor universally experienced but instead generate differentiated effects according to gendered social roles and structural inequalities.

2. Literature Review and Theoretical Framework

2.1. From Economic Growth to Everyday Well-Being

Over recent decades, increasing criticism has emerged regarding the limitations of Gross Domestic Product (GDP) and income-based approaches as indicators of social progress and human development. Although economic growth remains relevant, traditional macroeconomic indicators fail to capture essential dimensions of everyday life, including health, care, mobility, environmental quality, autonomy, social relationships, safety, leisure time, and emotional well-being (Stiglitz, Sen, & Fitoussi, 2009; Stiglitz, Fitoussi, & Durand, 2018; OECD, 2023).

This critique has been especially significant within feminist economics, which has long argued that conventional economic systems systematically ignore the material and relational conditions that sustain life, particularly unpaid domestic and care work, historically carried out mainly by women (Waring, 1988, 2018; Elson, 1995; Benería, Berik, & Floro, 2015). From this perspective, economic systems cannot be analyzed independently from the infrastructures and social arrangements that make everyday life possible.

Recent international debates on well-being and sustainable development have progressively reinforced this perspective. The OECD Well-being Framework, the Stiglitz-Sen-Fitoussi Commission, and the United Nations Human Development framework have all stressed the need to move beyond purely monetary indicators and incorporate multidimensional approaches capable of capturing how people actually live and experience their daily lives (OECD, 2020, 2023; UNDP, 2022).

Within this context, infrastructure can no longer be understood merely as a productive input supporting economic growth. Instead, infrastructure must be conceptualized as a determinant of well-being that shapes individuals' opportunities, time allocation, autonomy, mobility, care arrangements, and life satisfaction. Public transport systems,

childcare centers, hospitals, pedestrian spaces, parks, markets, care facilities, and leisure infrastructures are not neutral technical investments; they are material conditions that facilitate or constrain the development of human capabilities and subjective well-being.

The present paper builds upon this perspective and argues that infrastructure contributes to subjective well-being indirectly through its capacity to strengthen individuals' capabilities. Moreover, it proposes that this relationship is gendered because women and men experience infrastructure differently according to unequal distributions of care work, mobility patterns, time availability, and structural constraints.

2.2. Infrastructure for Everyday Life and Feminist Economics

The concept of infrastructure for everyday life emerges from feminist urbanism, feminist economics, and social reproduction theory. Early feminist critiques of urban planning demonstrated that modern cities and infrastructure systems were historically designed around a male breadwinner model that separated productive and reproductive spaces, neglecting the everyday needs associated with caregiving, domestic work, proximity, and social reproduction (Hayden, 1980, 1984).

Subsequent research developed these ideas by analyzing how infrastructure shapes daily routines and well-being differently for women and men (Horelli & Vepsä, 1994; Gilroy & Booth, 1999; Sánchez de Madariaga, 2004). Feminist planning scholars argued that transport systems, public spaces, lighting, pedestrian accessibility, proximity services, and care facilities are fundamental for sustaining everyday life and enabling social participation.

This perspective became particularly relevant in relation to mobility studies. Sánchez de Madariaga (2013) introduced the concept of the mobility of care, referring to the complex and multidirectional mobility patterns associated with caregiving responsibilities, accompaniment, domestic tasks, and household management. Unlike traditional commuting patterns focused on paid employment, mobility of care involves chained journeys, shorter distances, multiple destinations, and greater dependence on proximity services and public transport systems.

Recent literature has reinforced the importance of incorporating gender into infrastructure analysis. Small and van der Meulen Rodgers (2023) demonstrate that both physical and

social infrastructure investments have differentiated impacts by gender because women's labor market participation, autonomy, and time allocation are strongly conditioned by the availability of care-related infrastructure. Similarly, OECD reports emphasize that infrastructure planning frequently reproduces gender inequalities when it ignores differentiated patterns of use, accessibility, safety, and care responsibilities (OECD, 2019).

More recent studies have also linked infrastructure to broader debates on social sustainability and well-being. Liu et al. (2024) show that urban accessibility and proximity infrastructures significantly affect life satisfaction and mental well-being, particularly among populations with caregiving responsibilities. Likewise, de Vos (2023) argues that transport systems must be analyzed not only according to efficiency criteria but also according to their contribution to social inclusion, emotional well-being, and quality of life.

Despite these advances, infrastructure continues to be largely treated in mainstream economic analysis as a universal and gender-neutral category. Most infrastructure literature remains focused on productivity, competitiveness, and economic performance, while neglecting how infrastructure affects social reproduction, care organization, everyday routines, and subjective well-being. Furthermore, empirical studies linking infrastructure, capabilities, subjective well-being, and gender simultaneously remain extremely limited.

The present study addresses this gap by conceptualizing infrastructure as a social and institutional condition that affects subjective well-being through the development of human capabilities.

2.3. The Capability Approach and Infrastructure as a Conversion Factor

The theoretical basis of this study is grounded in the Capability Approach (CA), developed by Sen (1993, 1999) and expanded by Nussbaum (2000, 2011). The Capability Approach shifted welfare analysis away from utility maximization and resource ownership towards individuals' substantive freedoms to achieve valued ways of living.

Capabilities refer to the effective opportunities individuals have to develop essential dimensions of life, such as health, education, mobility, social participation, emotional

expression, autonomy, and access to meaningful social relations (Sen, 1999; Nussbaum, 2011). Importantly, individuals do not automatically transform resources into capabilities. The same level of resources may produce different outcomes depending on institutional conditions, social norms, environmental characteristics, and structural inequalities.

Robeyns (2005, 2017) conceptualized these mediating mechanisms as conversion factors, namely the social, institutional, environmental, and personal conditions that enable individuals to convert resources into real freedoms. Building on this framework, the present paper conceptualizes everyday life infrastructure as an institutional conversion factor.

From this perspective, childcare centers, public transport systems, pedestrian infrastructures, health centers, parks, leisure facilities, and care services expand individuals' opportunities to organize daily life, reconcile paid employment and caregiving, maintain social relationships, access education and health, and participate in society. Conversely, inadequate infrastructure can restrict these opportunities and reinforce inequalities.

This approach is particularly relevant for feminist economics because gender inequalities are not only linked to income differences but also to unequal access to time, mobility, care support, safety, and autonomy. Infrastructure therefore becomes central to the analysis of well-being because it conditions individuals' effective capabilities to live the lives they value.

The present study operationalizes this framework empirically through eight dimensions of capabilities associated with infrastructure provision: physical and mental health, social relationships, education, care and domestic work, labor market insertion, mobility, leisure and free time, and emotions. These dimensions were specifically incorporated into the survey design to evaluate how different infrastructures contribute to the development of capabilities throughout individuals' lives.

2.4. Subjective Well-Being and the Experience of Infrastructure

Alongside the Capability Approach, this paper incorporates the literature on Subjective Well-Being (SWB), which analyses how individuals evaluate and experience their own lives.

Subjective well-being includes cognitive evaluations such as life satisfaction together with affective dimensions involving emotions and feelings (Diener et al., 1985; Kahneman & Krueger, 2006). More recent research has emphasized that subjective well-being is deeply influenced by everyday environments, urban experiences, mobility conditions, time pressure, and social support systems (Rojas & Veenhoven, 2010; Clark, Flèche, Layard, Powdthavee, & Ward, 2018).

This literature is especially relevant for infrastructure analysis because infrastructures are experienced not only materially but also emotionally and relationally. Public spaces, mobility systems, parks, pedestrian areas, healthcare facilities, and leisure infrastructures shape perceptions of safety, autonomy, comfort, inclusion, stress, and quality of life.

Recent studies have reinforced the relationship between urban infrastructure and subjective well-being. Mouratidis (2021, 2024) demonstrates that urban form, accessibility, walkability, and neighborhood design significantly affect mental health, emotional well-being, and life satisfaction. Similarly, Ferreira, Barreira, and Loures (2024) show that public spaces and green infrastructure contribute positively to emotional well-being and social cohesion, particularly among women and older populations.

However, this paper does not interpret subjective well-being as an exclusively psychological phenomenon detached from structural conditions. Instead, subjective well-being is understood as socially and materially embedded. Individuals' perceptions of life satisfaction are shaped by institutional arrangements, care responsibilities, infrastructure accessibility, mobility conditions, environmental quality, and social inequalities.

This perspective aligns with attempts to integrate subjective well-being and capabilities within broader multidimensional frameworks of human development (Comim, 2005; Graham & Nikolova, 2015). Nevertheless, little research has explored whether infrastructure affects subjective well-being indirectly through capabilities, and even fewer studies have analyzed this relationship from a gender perspective. This constitutes one of the main contributions of the present paper.

3. Methodology

3.1. Research Design

This study forms part of the research project *Infrastructure for Everyday Life from the Feminist Economics of Well-Being* (*Infraestructuras para la Vida Cotidiana desde la Economía Feminista del Bienestar*), funded by the Spanish Ministry of Science, Innovation and Universities under the Knowledge Generation Projects programme (PID2022-141305OB-I00). The project aims to develop a multidimensional framework for analysing the relationship between infrastructure, capabilities, subjective well-being, and gender inequalities.

To achieve these objectives, the project adopts an integrative research design combining quantitative and qualitative methodological strategies through processes of theoretical, methodological, and analytical triangulation. The present paper focuses on the quantitative dimension of the project and specifically examines the mediating role of capabilities in the relationship between infrastructure access and subjective well-being, while also analysing gender differences in these relationships.

The analytical framework combines the Capability Approach and Subjective Well-Being theory. Infrastructure is conceptualised as an institutional conversion factor that contributes to the development of capabilities, which in turn influence subjective well-being. The empirical strategy therefore examines both direct and indirect effects between infrastructure, capabilities, and well-being outcomes.

3.2. Survey Design and Data Collection

The empirical analysis is based on an original nationwide survey specifically designed within the framework of the project. Unlike conventional infrastructure surveys focused mainly on service provision or satisfaction, this questionnaire was explicitly constructed to operationalise the multidimensional relationship between infrastructure, capabilities, and subjective well-being from a gender perspective.

The target population consisted of residents in Spain aged 18 years and over. A stratified multistage sampling design was employed. Municipalities were classified into three habitat-size strata: municipalities with fewer than 5,000 inhabitants, municipalities between 5,001 and 400,000 inhabitants, and municipalities with more than 400,000 inhabitants.

The sampling procedure included quotas by sex and age to ensure representativeness. Sex quotas were established at 51% women and 49% men, while age quotas were distributed across four groups: 18–30, 31–44, 45–64, and 65 years and over. The final sample comprised 1,502 interviews, with an estimated sampling error of ±2.6% at a 95.5% confidence level.

The survey questionnaire was structured around four main dimensions:

1. Access to infrastructure and perceived importance;
2. Objective well-being and capabilities;
3. Subjective well-being;
4. Socioeconomic and demographic background variables.

The questionnaire included detailed measures of access to eight types of infrastructure:

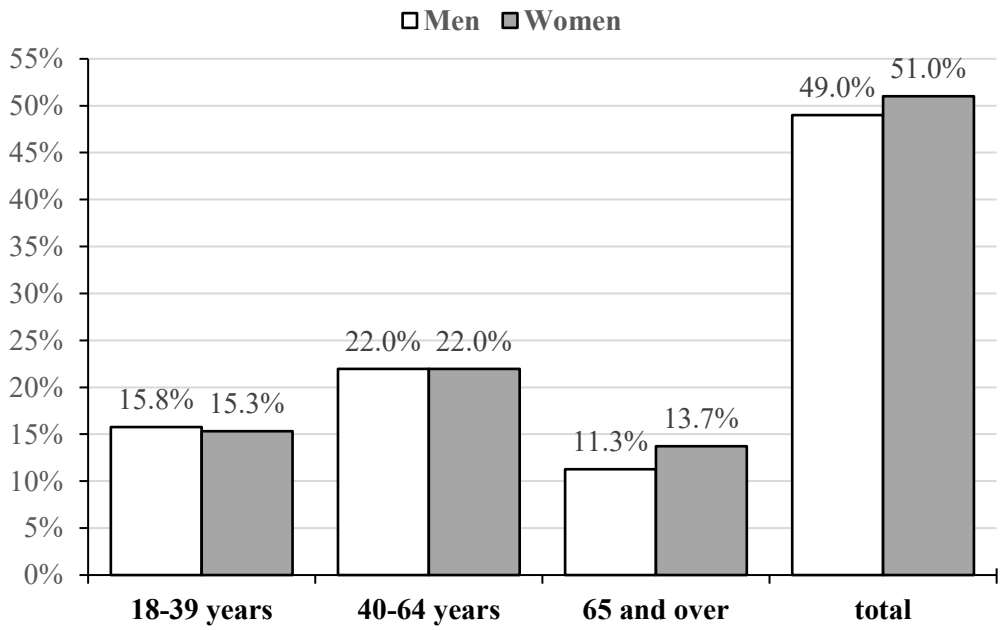
1. Childcare centers for children under three years old;
2. Health centers and hospitals;
3. Care centers for dependent persons;
4. Pedestrian spaces, parks, public lighting, and green areas;
5. Markets and shopping centers;
6. Public transport systems;
7. Leisure and cultural facilities;
8. Industrial parks .

Respondents evaluated both their level of access to each infrastructure and the perceived importance of each infrastructure for their daily lives using Likert-type scales ranging from 1 to 10.

3.3. Demographic Information of the Data

The characteristics of the survey attending to de distribution by sex and age of individuals surveyed is shown in figure 1. It is observed that 51.0% corresponds to women, being those from 40 to 64 years old the ones with more representation in the sample, being 22.0% of all. The greatest difference of representation by sex is among the people from 63 years old and elder in which women raises up to 13.7% of the total of people surveyed being 2.4 points over men. It is only in the layer between 18 and 39 years old where men have more participation than women.

Figure 1. Distribution by sex and age of the respondents



Source: Own elaboration based on the survey "Infrastructure for Everyday Life and Well-Being".

Table 1 shows the statistical summary of the individual demographic variables.

Table 1. Statistical summary of the variables

Variable	Mean	Standard deviation	Minimum	Maximum	#Obs.
Gender	1.51	0.50	1	2	1502
Age	50.10	17.10	18	94	1502
Education	4.74	1.38	1	6	1499

Subjective Well-being	7.79	1.65	1	10	1501
Labour situation	4.48	1.69	1	9	1501
Income	4.68	1.92	1	9	1343

Source: Own elaboration based on the survey "Infrastructure for Everyday Life and Well-Being"

3.4. Measurement of Capabilities and Subjective Well-Being

One of the main methodological innovations of the survey lies in the operationalisation of capabilities associated with infrastructure provision. Respondents were asked to assess the extent to which each type of infrastructure contributed to six dimensions of capabilities throughout their lives:

1. Physical and mental health;
2. Social relationships;
3. Education;
4. Domestic and care work;
5. Labor market insertion;
6. Economic situation of the household.

These dimensions were directly inspired by the Capability Approach literature and adapted to the context of infrastructure and everyday life from a feminist economics perspective. Rather than measuring capabilities solely through objective indicators, the survey captures respondents' own evaluations regarding how infrastructure contributes to their ability to develop these dimensions of well-being.

Subjective well-being was measured using multiple indicators. First, respondents evaluated their satisfaction with several life domains, including health, relationships, education, care responsibilities, employment, household economic situation, public transport services, leisure time, and emotional development. Second, the questionnaire incorporated broader cognitive evaluations of life satisfaction through agreement with statements regarding life conditions and personal fulfilment. Finally, overall life satisfaction was measured through a general question asking respondents to evaluate their satisfaction with life on a scale from 1 to 10.

In addition, the survey collected extensive socioeconomic and demographic information, including employment status, income, educational level, household composition, caregiving responsibilities, place of residence, disability, migration background, and time allocation for paid work, care activities, mobility, leisure, and social relationships.

3.5. Variables and Operational Definitions

- **Access to Infrastructure** (A_h)

The access to infrastructure h, denoted by A_h, corresponds to the value obtained in question P1.h, which requires an assessment from 1 to 10 of the level of access of the infrastructure h of the respondent. A scale from 1 to 10 is used, where 1 means 'completely non-existent' and 10 means 'excellent availability,' in relation to the level of access. Where h=1,2,…,8 corresponds with (1) nursery schools up to 3 years; (2) health centers and hospitals; (3) sidewalks and pedestrians paths, street lights and parks and green areas; (4) care centers for dependent people (nursing homes, day centers, centers for people with disabilities, etc.); (5) markets and shopping centers; (6) public transport (used for local travel and daily commuting); (7) leisure and cultural facilities (theaters, cinemas, exhibition halls) and sports facilities (swimming pools, gyms, fitness centers, etc.); and (8) industrial parks.

- **Importance of the infrastructure *h* is for his/her subjective well-being (Imp_h)**

The importance of the infrastructure h is measured by the score assigned to the question PX.h. This question asks respondents to rate, on a scale from 1 to 10, how important they consider the infrastructure to be for their personal well-being, with 10 meaning 'very important' and 1 meaning 'not important at all'.

- **Capability k (CA_k)**

The level of capability k denoted by CA_k corresponds to the value obtained in question P12_k, which asks respondents to rate, on a scale from 1 (lowest) to 10 (highest), their satisfaction with capability. The capabilities considered are (k = 1 to 6): (1) physical and mental health; (2) social relationships; (3) education; (4) care and domestic work; (5) employment; and (6) the economic situation of the household.

- **Importance of access to the infrastructure *h* is for capability k (S_{hk})**

The importance of access to the infrastructure *h* is for capability *k*, denoted by S_{hk}, represents the score of infrastructure *h* at capability *k*. This variable takes its values from the response to question PX_k, in which respondents were asked to rate how important infrastructure *h* is for their capability *k* on a scale from 1 to 10, where 10 indicates 'very important' and 1 indicates 'not important at all.'

- **Contribution of Infrastructure to Capabilities (C_k)**

To quantify the contribution of access to infrastructures to the improvement of a capability *k*, denoted by C_k, a weighted sum of access to all infrastructures is computed. The weights correspond to the normalized scores assigned to the importance of each infrastructure for capability *k*. The construction is detailed below:

The contribution of infrastructure h to capability k is represented by $w_{hk} \cdot A_h$, where:

- w_{hk} is a parameter that captures the impact of infrastructure h on capability k. This parameter is derived from the score assigned to the importance of infrastructure h for capability k, denoted as S_{hk}, which ranges from 1 to 10. The score is then rescaled to the interval [0,1] using the following formula:

$$w_{hk} = \frac{S_{hk} - \min(S_{hk}, h = 1,2,\dots,8)}{\max\left(S_{hk,} h = 1,2,\dots,8\right) - \min(S_{hk}, h = 1,2,\dots,8)}, h = 1,2,\dots,8$$

and $k = 1,2,\dots,6$. (1)

- A_h, as previously defined, denotes the individual's level of access to infrastructure h.

The coefficient C_k quantifies the extent to which capability *k* is enhanced through access to infrastructure and is calculated as:

$$C_k = \sum_{h=1}^{8} w_{hk} A_h, \qquad (2)$$

where w_{hk} is defined above, and A_h represents the score of access to the infrastructure h.

Subjective Well-Being (*SWB*)

SWB is measured through self-reported responses to life satisfaction questions, typically on a 0–10 scale, which are standardized for analysis.[1]

3.6. Hypotheses

Based on the theoretical framework, four hypotheses were formulated, operationalized through specific statistical indicators:

- **H1**: *Access to infrastructure (measured by A_h, where h indexes each type of infrastructure) improves subjective well-being indirectly through its positive effect on capabilities. This mediating relationship is tested using a statistical mediation model.*
- **H2**: *The effect of infrastructure access (except industrial parks) on subjective well-being is greater for women than for men, reflecting gender-based differences in baseline capability conditions and structural constraints.*
- **H3**: *The contribution of each infrastructure h (except industrial parks) to the improvement of each capability k (measured by the weight $w_{hk} \cdot A_h$) is greater for women than for men. This reflects the potentially transformative role of infrastructure in enhancing women's capabilities.*
- **H4**: *The achieved level of each capability k, as enabled or supported by infrastructure (measured by C_k), is higher for women than for men, suggesting a differential impact of infrastructure across gender lines.*

3.7. Analytical Strategy

- **H1 (Mediation Analysis)**

  To test the hypotheses, the study employs Structural Equation Modelling (SEM) using the lavaan package in R (version 0.6-19). SEM was selected because it

[1] The subjective well-being (*SWB*) is constructed on the basis of the answers of the respondents to question P14N_1, which states: "Taking everything in your life into account, could you tell me on a scale from 1 to 10 how satisfied you are with your life overall, where 1 means you are not at all satisfied and 10 means you are very satisfied?"

allows the simultaneous estimation of direct and indirect relationships between infrastructure access, capabilities, and subjective well-being.

The mediation framework assumes that infrastructure affects subjective well-being both directly and indirectly through capabilities. In the empirical specification, multiple capability dimensions are included as parallel mediators between infrastructure access and subjective well-being outcomes.

The analytical model estimates:

1. The effects of infrastructure access on each capability dimension;

2. The effects of capabilities on subjective well-being;

3. The direct effects of infrastructure access on subjective well-being after controlling for capabilities;

4. The indirect effects of infrastructure through capabilities.

Indirect effects were calculated as the product of the coefficients linking infrastructure to capabilities and capabilities to subjective well-being. Total effects were obtained by combining direct and indirect effects.

The theoretical framework follows the standard mediation logic, as detailed below:

Step 1: $CA_k = \alpha_0 + \alpha_1 A_h + \varepsilon$ (3)

Step 2: $SWB = \beta_0 + \beta_1 A_h + \beta_2 CA_k + \eta$ (4)

Where, as above indicated, A_h access to infrastructure, CA_k denotes the capability variable, and SWB corresponds to subjective well-being. Thus, the influence of A_h on SWB (total effect) is obtained by adding the coefficient β_1 from the regression corresponding to the direct path of influence (direct effect) to the coefficient capturing the indirect influence through CA_k (indirect effect), which is given by the product $\alpha_1\beta_2$ (Igartua & Hayes, 2021). Mediation is confirmed when

this product, the indirect effect, is statistically significant (Igartua &Hayes, 2021; Hayes, 2022).

In our empirical specification, we extended this framework to incorporate multiple mediators in parallel. Specifically, six capability dimensions ($CA_1, CA_2, CA_3, CA_4, CA_5, CA_6$) were regressed on access to each infrastructure h (A_h), and subjective well-being (*SWB*) was regressed on both the capability variables and the access variable, while also controlling for covariates (income, *INC*; education, *EDU*; and labor situation, *SITLAB*):

$$CA_k = \alpha_0 + \alpha_k A_h + \varepsilon \qquad k=1,2,\ldots,6 \tag{5}$$

$$SWB = \beta_0 + \beta_{1h} A_h + \sum_{k=1}^{6} \beta_{2k} CA_k + \delta_1 INC + \delta_2 EDU + \delta_3 SITLAB + \zeta,$$

$$h = 1,2,\ldots,8 \tag{6}$$

where:

- α_k denotes the regression coefficients linking access to infrastructure h, A_h, with each capability.
- β_{2k} are the regression coefficients linking the capabilities with *SWB*.
- β_{1h} is the direct effect of A_h on *SWB*.
- $\delta_1, \delta_2, \delta_3$ are the effects of the additional covariates.
- ε and ζ are error terms.

Indirect effects were calculated as the product of the coefficients linking infrastructure to capabilities and capabilities to subjective well-being. Total effects were obtained by combining direct and indirect effects. In detail, the indirect effects were calculated as:

$$\text{Indirect effect via } CA_k = \alpha_k \beta_{2k}$$

And the total effect of access to infrastructure h on subjective well-being was computed as:

$$\text{Total effect}=\beta_{1h}+\sum_{k=1}^{6}\alpha_k\beta_{2k}.$$

Models were estimated using maximum likelihood (ML) with standard errors. Model fit was assessed using the χ^2term, the Comparative Fit Index (CFI), the Tucker-Lewis Index (TLI), the Root Mean Square Error of Approximation (RMSEA) and the Standardized Root Mean Square Residual (SRMR).

H2–H4 (Gender Differences and Interaction Effects)

To examine gender differences, interaction terms between gender and infrastructure variables were incorporated into the regression models. Additional analyses compared women and men regarding:

1. The magnitude of infrastructure effects on subjective well-being;

2. The contribution of infrastructure to capability development;

3. The levels of capability enhancement associated with infrastructure access.

All models were estimated both with and without control variables, including income, educational level, and labour market status, to assess the robustness of the results.

The regressions used are specified below:

For **H2** the regression considered is[2]:

$$Imp_h=\alpha_0+\alpha_1 CODSEXO+\beta_1 INC+\beta_2 EDU+\beta_3 SITLAB\ +\varepsilon\ ,h=1,2,\ldots,8 \quad (7)$$

For **H3**, we compare the contribution of each infrastructure h to the improvement of each capability k (measured by the weighted access $w_{hk}A_h$) by gender subgroups as follows:

$$w_{hk}A_h=\alpha_0+\alpha_1 CODSEXO+\beta_1 INC+\beta_2 EDU+\beta_3 SITLAB\ +\varepsilon\ ,$$

$$k=1,2,\ldots,6;\ h=1,2,\ldots,8. \quad (8)$$

[2] CODSEXO takes the value 1 for males and 2 for females.

For **H4**, we compare mean values of the improvement of a capability k for access to infrastructure, C_k across gender through the regression:

$$C_k = \alpha_0 + \alpha_1 CODSEXO + \beta_1 INC + \beta_2 EDU + \beta_3 SITLAB + \varepsilon, k = 1,2,\ldots,6. \quad (9)$$

4. Results

Table 2 presents the direct and indirect effects obtained from the mediation model. As can be observed, the direct effect of Access to Infrastructure on Subjective Well-being was not significant, whereas the indirect effects through Capabilities were positive and significant, indicating a full mediation effect.

Table 2. Direct and indirect effects of the mediation model

	Infrastructure							
	I1	I2	I3	I4	I5	I6	I7	I8
Effect	β	β	β	β	β	β	β	β
Direct	0.01	-0.023	0.027	-0.003	-0.045	0.002	0.019	0.028
Indirect 1	0.025***	0.031***	0.030***	0.033***	0.035***	0.023**	0.041***	0.028***
Indirect 2	0.014*	0.013*	0.010*	0.013*	0.014*	0.007*	0.015*	0.012*
Indirect 3	0.012*	0.014*	0.010*	0.012*	0.010*	0.010*	0.013*	0.011*
Indirect 4	0.012**	0.017**	0.012*	0.017**	0.016**	0.011*	0.017**	0.014**
Indirect 5	0.011*	0.018**	0.013*	0.011*	0.013*	0.008*	0.015*	0.012*
Indirect 6	0.012**	0.015**	0.017**	0.014**	0.013**	0.012**	0.017**	0.013**
Total	0.096***	0.086***	0.119***	0.097***	0.056*	0.072**	0.136***	0.117***

Source: Own elaboration.

Notes. β = standardized coefficient. Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1. I1: nursery schools up to 3 years; I2: health centers and hospitals; I3: sidewalks and pedestrians paths, street lights and parks and green areas; I4: care centers for dependent people; I5: markets and shopping centers; I6: public transport; I7: leisure and cultural facilities; and I8: industrial parks.

Table 3 presents the coefficients of regression (7), with and without control variables. With the exception of industrial parks, all coefficients are positive, revealing that women assign greater importance than men to the contribution of all infrastructures (except industrial parks) to subjective well-being. With only a few exceptions, the coefficients are highly significant.

Table 3. Effect of Gender on Importance (with and without controls)

Dependent variable	CODSEXO (α_1) without controls	#Obs.	CODSEXO (α_1) with controls	#Obs.
Imp_1	0.169	1487	0.131	1344
Imp_2	0.217**	1501	0.143	1355
Imp_3	0.403*	1490	0.484**	1346
Imp_4	0.562***	1500	0.445***	1355
Imp_5	0.542***	1501	0.506***	1355
Imp_6	0.636***	1499	0.613***	1355
Imp_7	0.193.	1498	0.181.	
Imp_8	-0.527***	1493	-0.480**	1349

Source: Own elaboration.

Notes: Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Models with controls include income (INC), education (EDU), and labour situation(SITLAB).

Models without controls include only the variable CODSEXO (gender).

Table 4 presents, without and with control variables, the coefficients of regression (8), which compares the contribution of each infrastructure to the improvement of each capability $\boldsymbol{k}$ (measured by the weighted access $\boldsymbol{w_{hk}A_h}$) according to gender. All coefficients (except those corresponding to industrial parks) are positive, reflecting that, unlike the case of industrial parks, the impact of the remaining infrastructures considered on capabilities is greater for women than for men. Except for a few cases, all coefficients are significant.

Table 4. Impact of infrastructure h on capability k, $w_{hk}A_h$ (without and with controls)

Dependent variable	Estimate without controls	#Obs.	Estimate with controls	#Obs.
$w_{11}A_1$	6.439***	1455	6.670***	1317
$w_{12}A_1$	5.279**	1457	4.604*	1319
$w_{13}A_1$	4.066*	1458	3.520 .	1320
$w_{14}A_1$	7.669***	1446	6.871***	1309
$w_{15}A_1$	7.001***	1454	6.653***	1316
$w_{16}A_1$	7.022***	1456	6.443***	1319
$w_{21}A_2$	5.020***	1502	3.880**	1356
$w_{22}A_2$	5.550***	1500	3.190 .	1355
$w_{23}A_2$	5.626***	1496	4.312*	1351
$w_{24}A_2$	3.498*	1487	1.886	1344
$w_{25}A_2$	5.511***	1496	4.760**	1352
$w_{26}A_2$	5.669***	1497	3.605*	1353
$w_{31}A_3$	3.422*	1440	3.256 .	1304
$w_{32}A_3$	2.659 .	1445	2.006	1308
$w_{33}A_3$	2.767 .	1441	2.376	1304
$w_{34}A_3$	2.963 .	1437	3.253 .	1300
$w_{35}A_3$	5.604***	1443	5.658***	1306
$w_{36}A_3$	3.553*	1442	3.414*	1306
$w_{41}A_4$	5.114***	1499	3.649*	1353
$w_{42}A_4$	4.627***	1500	3.602*	1355
$w_{43}A_4$	4.971***	1500	4.020*	1354
$w_{44}A_4$	6.351***	1489	5.069**	1345
$w_{45}A_4$	3.447*	1499	2.332	1354
$w_{46}A_4$	4.901***	1501	3.964*	1355
$w_{51}A_5$	3.651*	1498	2.762 .	1352

$w_{52}A_5$	3.651*	1498	2.762 .	1352
$w_{53}A_5$	3.255*	1496	2.374	1350
$w_{54}A_5$	4.420**	1489	3.823*	1345
$w_{55}A_5$	3.894**	1495	3.856*	1350
$w_{56}A_5$	4.499**	1495	4.166*	1350
$w_{61}A_6$	6.9161***	1486	6.184***	1344
$w_{62}A_6$	5.554***	1487	4.612**	1344
$w_{63}A_6$	4.479**	1485	3.490*	1342
$w_{64}A_6$	5.998***	1475	5.089**	1333
$w_{65}A_6$	5.745***	1483	5.679**	1341
$w_{66}A_6$	4.591**	1489	4.085*	1346
$w_{71}A_7$	0.544	1499	1.266	1353
$w_{72}A_7$	2.028	1499	2.148	1353
$w_{73}A_7$	1.478	1498	1.993	1353
$w_{74}A_7$	4.050**	1478	3.877*	1334
$w_{75}A_7$	2.444 .	1493	2.883 .	1350
$w_{76}A_7$	3.656*	1495	3.816*	1351
$w_{81}A_8$	-5.661***	1480	-5.134***	1339
$w_{82}A_8$	-7.086***	1482	-6.793***	1340
$w_{83}A_8$	-6.845***	1484	-6.517***	1342
$w_{84}A_8$	-4.666***	1476	-5.359***	1335
$w_{85}A_8$	-9.787***	1483	-8.725***	1342
$w_{86}A_8$	-6.609***	1482	-6.083***	1340

Source: Own elaboration.

Notes: Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Models with controls include income (INC), education (EDU), and labour situation (SITLAB).

Models without controls include only the variable CODSEXO (gender).

Finally, Table 5 reports the results of regression (9), which compares the impact of the set of infrastructures analyzed on the improvement of each capability k according

to gender. All coefficients are positive and highly significant, indicating that infrastructures contribute more strongly to the improvement of capabilities for women than for men.

Table 5. Impact of infrastructure on capability *k* (with and without controls)

Dependent variable	CODSEXO (α_1) without controls	#Obs.	CODSEXO (α_1) with controls	#Obs.
C_1	45.702***	1363	46.223***	1236
C_2	2.329***	1364	1.819*	1235
C_3	34.350***	1333	31.627**	1211
C_4	3.667***	1273	3.495***	1155
C_5	3.036***	1286	3.257***	1171
C_6	3.068***	1326	2.447***	1202

Source: Own elaboration.
Notes: Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1.
Models with controls include income (INC), education (EDU), and labor situation(SITLAB).
Models without controls include only the variable CODSEXO (gender).

5. Conclusions

The empirical results provide strong support for the four hypotheses formulated in the study.

First, the mediation analysis confirms H1, showing that access to infrastructure does not exert a significant direct effect on subjective well-being, but rather an indirect effect through the enhancement of capabilities. The positive and significant indirect effects indicate that capabilities fully mediate the relationship between infrastructure access and subjective well-being. This finding reinforces the theoretical argument that infrastructures improve well-being primarily by expanding individuals' opportunities and freedoms rather than through a direct mechanism.

Second, the results support H2, as the estimated coefficients reveal that, with the exception of industrial parks, the contribution of infrastructure access to subjective well-being is systematically greater for women than for men. The positive and highly significant coefficients suggest that women derive comparatively larger well-being gains

from infrastructure provision, likely reflecting the existence of greater structural constraints and lower baseline capability conditions.

Third, the evidence also confirms H3. The regression results indicate that the contribution of each type of infrastructure to the improvement of capabilities is generally stronger for women than for men. Except in the case of industrial parks, all coefficients are positive and, in most cases, statistically significant. These findings highlight the transformative role that infrastructure can play in enhancing women's capabilities and reducing gender-based inequalities in access to opportunities.

Finally, the results provide robust support for H4. The positive and highly significant coefficients associated with the aggregate impact of infrastructures on capabilities demonstrate that the achieved level of capabilities is higher for women than for men when supported by infrastructure provision. This suggests that infrastructures generate differentiated benefits across gender groups, contributing more intensively to the expansion of women's capabilities.

Overall, the findings underscore the relevance of infrastructure not only as a driver of subjective well-being, but also as a mechanism for capability enhancement and gender equality. The results emphasize the importance of incorporating a gender-sensitive perspective into infrastructure planning and public policy design, given the stronger positive effects observed for women across most of the dimensions analyzed. Furthermore, the evidence suggests that infrastructure policies can play a key role in reducing structural inequalities by disproportionately improving women's capabilities and well-being outcomes. In this sense, the study contributes to the literature by highlighting the central role of capabilities as the channel through which infrastructure affects subjective well-being, while also demonstrating that these effects are not gender neutral.

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