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Gender Issues, Social Equity, and the Sustainable Management of Urban Transport Networks: An Italian Case Study

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Abstract

The paper contains transport and environmental analyses for the Gallipoli area and presents results from a consultation process involving transport operators, citizens, tourists, public employees, and stakeholders. Through statistical analysis of the data, the paper provides insights into the needs of specific user categories, highlighting gender issues and social equity as key aspects of urban policies. This paper further investigates users' potential willingness to pay for general improvements in bus service quality and environmental conditions using discrete choice modeling. This study aims to address the challenge of understanding urban travel patterns and the underlying forces influencing user attitudes, which are often found in city surveys. Specifically, a Random Utility Model was used to profile users based on specially collected survey data. The results indicate the potential to meet latent systemic transport demand with more sustainable collective transport modes, particularly among women aged 19-29 who own a car. Simultaneously, there is a willingness to pay higher public transport tariffs for improved service, which is also largely environmentally sustainable. The paper can serve as a valuable resource for professionals in the transport and environmental sectors as well as for policymakers.

Keywords: Sustainable mobility, Gender issues, Random utility model, Willingness to pay, Policy recommendations

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Introduction

The paper examines different aspects with the objective of addressing transport and environmental knowledge needs, particularly with regard to Gallipoli. The aim is to provide policy recommendations considering the specific needs of women, economic operators, and stakeholder exigencies. The paper includes transport and environmental analyses for the Gallipoli area and presents results from a consultation process involving transport operators, citizens (particularly women), tourists, public employees, and stakeholders. Through statistical analysis of data (which describes the nature of the data, explores its relationship to the underlying population, creates a model, and validates it), several insights are provided on the needs of specific user categories, emphasizing gender issues and social equity as key elements of urban policies. In addition, the paper investigates the potential willingness of users to pay for general improvements in bus service quality and environmental conditions using discrete choice modelling. The data source is an ad hoc survey conducted in 2013 and validated by the relevant authorities in 2015, who supported the data acquisition process. The method employed is Random Utility Models, which allows for the probabilistic evaluation of the importance of factors influencing user behavior. Specifically, it determines the impact of various components on women's choices regarding public transport and their willingness to pay. The study aims to overcome the crucial impediment in understanding urban travel patterns and the key forces influencing user attitudes, which are often characteristic of city surveys. As indicated by Gauvin et al. (2020), studies based on gender-disaggregated large-scale data are still lacking, limiting the understanding of gendered aspects of urban mobility and the ability to design policies for gender equality. Therefore, the paper considers attitudinal and behavioural variables to assess women's propensity to use buses and change modal choices towards more environmentally sustainable options through a random utility model. Finally, perspectives and conclusions are provided. This paper can serve as a valuable tool for professionals in the transport and environmental sectors, as well as for policymakers interested in analyzing travel behaviour while considering gender issues.

Gender and Mobility

Following Hanson (2010), feminists have long recognized that gender and mobility are inseparable, influencing each other in profound and often subtle ways. Addressing complex societal problems requires a deeper understanding of the relationship between gender and mobility. Research on how mobility shapes gender has often focused on gender, neglecting the mobility aspect. Conversely, studies on how gender shapes mobility have extensively explored mobility while giving much less attention to gender. This

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review of the literature highlights knowledge gaps that must be addressed for feminist research on gender and mobility to effectively contribute to advancing sustainable mobility. On the other hand, there is an increasing mismatch between the everyday rights framed within planning and the direct experiences of marginalised urban dwellers. The urban scale has become increasingly important in attempts to promote progressive collective rights in the face of neoliberalism. Various theoretical and activist perspectives, notably the neo-Lefebvrian "right to the city," have emerged as means to reclaim urban spaces (Beebeejaun, 2016).

Hanson (2010) argues for a shift of the research agenda to synthesize these two strands of thinking along three lines: across ways of understanding gender and mobility, across quantitative and qualitative approaches, and across different geographical contexts.

Literature on gender and mobility over the past decades can be summarised in terms of the following core questions:

- **"How does movement shape gender?"** This question addresses issues such as how processes of mobility and immobility shed light on the shifting power relations embedded in gender (Valentine, 1989; Koskela, 1999; Hapke & Ayyankeril, 2004; Mandel, 2004; Kern, 2005; Wright 2005).
- **"How does gender shape movement?"** This question focuses on how gendered processes create, reinforce, or change patterns of daily mobility (Tanzarn, 2008; Srinivasan, 2008; Hough, Cao, & Handy, 2008, Elias, Newman, & Shiftan 2008).
- **"To what extent can gender contribute to achieving more sustainable mobility in terms of social justice?"** This question explores the role of gender in fostering more equitable and sustainable mobility (Sagaris & Tiznado-Aitken, 2023; Tiznado_Aikten et al., 2024; Mijailović et al., 2024).

Interestingly, each of these non-intersecting bodies literature starts from different assumptions about what is important, employs distinctive methodologies, and has varying understandings of gender, mobility, and the contextual elements to prioritize.

Results from the Consultation Process with Stakeholders and Focus Groups Operating in the Transport Sector

Since gender needs to be integrated into an already complex planning field, which includes multiple and often overlapping issues related to data collection, analyses, policy drafting, and program implementation, there are no readily available theories for creating a gender-equitable city. Therefore, it is necessary to acknowledge these complexities and build on a range of

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theories and analyses. A combination of socio-psychological and feminist theories, socio-technical transition theory, mobility biographies, and social practice theory framework can be used to frame women's transport needs, usage, and implications for future planning (Uteng, 2021).

This section applies a socio-economic theoretical framework to examine transport supply and demand in relation to women's behavior concerning urban mobility.

The case study focuses on the city of Gallipoli, where firms have been selected from the database of the Italian Chamber of Commerce. These firms, classified under ATECO codes H49, H50, H51, and H53, were part of the transport sector. They were contacted to identify key issues within the territory, particularly regarding the transport sector. The goal is to provide a framework for understanding the structure of transport supply and its distribution in light of territorial characteristics. A total of 192 firms were selected for focus group discussions. The questionnaire used was intentionally brief to ensure that the essential elements of transport supply were quickly identified. This approach facilitated the collection of useful information for making informed decisions about transport market organization and logistic services. Stakeholders were asked specific questions related to transport and environmental aspects.

Consultation Results

Based on the contributions obtained, it is evident that the current transport system is inadequate. The seasonal phenomenon significantly impacts transport and the environmental situation. Furthermore, the funnel-shaped access to the historical center creates enormous congestion problems, especially in the summer when access to the sea is also required. Tourist traffic, with its seasonal effects, exacerbates this issue. There is a mismatch between the demand for private motorised transport and available supply. Interviewees also noted that the road network is insufficient for both private vehicles and buses, with issues related to road capacity and tourist reception. Public services are provided under a service contract, but there are opportunities to cover a larger geographical area and extend service hours. Current demand is unmet in these areas, and suggested improvements focus on infrastructure and demand regulation in congested areas. An alternative service supply better suited to users' needs is required. The proposed interventions are expected to enhance accessibility and improve the environment by promoting more sustainable transport modes. Financing these interventions will require the participation of the Municipality of Gallipoli and private investors where possible. Interviewees prioritized the construction of a new coast road parallel to the existing one and the installation of air quality

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monitoring units to assess transport impacts. Implementing these measures could involve appropriate transport demand management tools and regulating access to congested areas.

In conclusion, the analysis and consultations have provided a clearer framework for Gallipoli's needs and potential solutions. The area experiences high transport demand compared to the regional framework, which is satisfied almost exclusively by road transport. Consequently, stakeholders advocate for the reduction of congestion through infrastructural investments, economic interventions, and laws to manage transport demand. Additionally, tools to modify modal choices and promote environmentally friendly choices are necessary. Interviewees also suggest that implementing the proposed interventions and providing adequate services aligned with expressed needs will stimulate local development and attract further tourism, thereby offering a competitive advantage for the territory. This approach will satisfy transport needs and enhance city accessibility through a more efficient transport system.

Survey Results and Empirical Findings on the WTP

Concerning the transport demand side of the market, interviews were conducted with 383 individuals at key transport points in the City of Gallipoli, including some hotels and the Municipality's front offices. Moreover, employees of the Municipality of Gallipoli participated in these consultations. The questionnaire was designed to gather information on personal profiles (such as age, gender, and occupational status), modal transport choices and motivations, evaluation of transport modes, preferences, and willingness to pay. In the sample, the gender distribution shows a slight majority of females at 53.3%, compared to 46.7% males. The age composition reveals that over 35% of respondents are in the 30-50 age range, followed by those aged 19-29 and 51-65, with the smallest groups being those under 19 and over 65 years old, at 8%. Regarding car availability, 45.69% of respondents always have access to a private vehicle, while 41.78% can use a private mode only occasionally. A small percentage, 12.53%, do not have access to private transportation, indicating how private cars are typically used within families. The results regarding transport modes reveal that a high percentage, 38.62%, use private cars. This figure is complemented by 6.65% who use motorcycles and 4.6% who use bicycles. Notably, 12.53% of respondents walk, which can be attributed to Gallipoli's small size. Additionally, taxis are used, mainly by tourists and for business purposes. Concerning bus use, 30.4% of interviewees reported using buses only rarely. Combined with the 20.1% who never use buses, this highlights a clear preference for other modes and indicates that public transport is less considered for internal travel. Conversely, 22.4% of respondents use buses regularly, with 21% using them 1-2 times a week and 6.1% using them 3-4 times a week.

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To further interpret the data on individual choices related to bus services in Gallipoli, a random utility model framework has been used. According to Green (1997), let ym and yp represent an individual's utility for two choices, denoted Ua e Ub . The observed choice between the two reveals which option provides greater utility. Therefore, the observed indicator equals 1 if Ua > Ub and 0 if Ua ≤ Ub. A common formulation of the linear random utility model is:

$$Ua = ß'a\ x + \square\ a \text{ and } Ub = ß'b\ x + \square\ b.$$

Then, if the consumer's choice of alternative a is denoted by Y=1, the following holds:

$$\begin{aligned} &Prob[Y=1|x] \quad = Prob[Ua > Ub\ ] \\ &= Prob[ß'a\ x + \square a - ß'b\ x - \square b > 0|x] \\ &= Prob[(ß\ a - ß\ b)'\ x + \square a - \square b > 0|x] \\ &= Prob[ß'x + \square > 0|x]. \end{aligned}$$

This model is widely used for simulating transport demand. However, it may present some problems. For further discussion, see Cascetta and Papola (2001), Maddala (1999), and Green (1997). The individual's utility for the two choices – using buses versus private means – is estimated by binary logistic regression. Logistic regression coefficients are used to estimate odds ratios for each independent variable in the model. The dependent variable, representing the probability of using buses, is coded as 1. All independent variables have been transformed into dummy variables to capture characteristics such as age and availability of private transport. Equations have been estimated using a single attribute to avoid evident correlation problems and potential self-selection biases in the data. Specifically, this model calculates the probability that users, in this case women, with specific characteristics (age, availability of other transport means, frequency of bus use, and travel motivation) will use public transport and their willingness to pay.

The selection of parameters is based on their significance, checked using the Wald statistic at a 5% level. All parameters have been chosen using the Wald forward selection method. The values reported in Table 1 are all significant according to the Wald test (Venezia 2015).

Table 1. Women- Probability of using buses and WTP for an improvement in bus services

Female user profile variable/attribute	Items	Probability of using bus	WTP
Age	19-29	8.50	
	30-50	4.10	1.55
	51-65	14.57	1.78
Availability of other transport means			
	Always	3.01	
	Sometimes	0.75	3.12
	Never		1.58

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Frequency of bus use			
	Every day	86.34	1.38
	1-2 times per week	6.37	1.72
	3-4 times per week		3.99
	Rarely	1.51	
Reasons	School/work activity	15.62	1.65
	Leisure activity	10.52	1.02
	Shopping	4.93	1.94

Table 1 shows the odds ratios for various coefficients, indicating the probability of women—who represent the most significant sample section—using public buses compared to other transport modes in an urban context. It also assesses their willingness to pay extra for overall improvements in bus service, using the same methodology as previously described. The probability is outlined as a function of various profile variables.

Table 1 shows that the probability of women using buses is highest among those aged 51-65, followed by those aged 19-29, and then those aged 30-50. Women with constant access to a car or other transport means are more than twice as likely to use the bus compared to those who only occasionally have a car. The primary reasons driving women to use buses are study or work, which are three times more influential than for those using buses for shopping and one and a half times more important than for leisure activities. Additionally, Table 1 provides insight into women's willingness to pay more for improved bus services, potentially encouraging changes in their travel habits. The parameter selection and estimation methods used for this analysis are consistent with those applied to public bus usage. For women, the optimal profile includes being in the 30-50 age range, having occasional access to another transport means, using the bus 3-4 times per week, and using the bus primarily for shopping.

Therefore, the results suggest a clear opportunity to meet latent systemic transport demand with more sustainable collective transport modes, particularly for women aged 19 and 29 who always have a car. There is also a willingness to pay higher public transport tariffs for better service, which aligns with environmentally sustainable practices.

Conclusion

In conclusion, the results underscore the need for targeted intervention in Gallipoli. While the administration's efforts in planning and programming are commendable, a gap remains between the needs of the population, economic operators, stakeholders, and the decisions made by policy-makers. This gap arises from delayed execution of plans, which slows operational procedures—a common element at the national level—and from insufficient engagement with community needs to set priorities and allocate limited

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financial resources efficiently, especially concerning gender issues. This challenge is not unique to Gallipoli but reflects a broader problem, often due to inadequate structures for managing business operations. Therefore, it is crucial to continually monitor territories from a transport and environmental perspective to ensure that services are provided efficiently. New infrastructures should be developed based on expressed and potential needs.

The results indicate that current methodologies are highly refined and effective in measuring impacts and results in terms of Sustainable Development Goals (SDGs). Scientific methodological reviews are instrumental in selecting appropriate metrics for local administrations. However, there is still a lack of large-scale, gender-disaggregated data, which limits the understanding of gendered aspects of urban mobility and hampers the design of policies for gender equality (Gauvin et al., 2020). The study shows that administrations have made progress in improving transport impact, though significant territorial imbalances remain. The case study illustrates this, particularly in countries where improving transport sustainability—primarily by reducing greenhouse gas emissions and promoting shared mobility in favour of collective modes—could be enhanced by considering gender issues and social equity. Similar recommendations are discussed in Mijailović et al. (2024).

With particular regard to Gallipoli, it is desirable to implement transport demand management tools through regulations that promote accessibility and encourage modal diversion toward environmentally sustainable means. These needs must be addressed in light of seasonal problems such as congestion, which affect the quality of life in the urban center. In this context, implementing drastic interventions during the summer period could promote the use of bicycles and increase the frequency and geographical coverage of public transport services extending to the sea. Additionally, achieving the desired modal switch and promoting rational behavioural transport choices could be facilitated through effective dissemination of information using accessible ICT tools and across all integrated transport modes.

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