

Women's intention to work in men-dominated professions: The case of motorcycle taxi drivers in Kigali, Rwanda

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ABSTRACT

Gender imbalance in the transport sector is a growing concern. Worldwide, women are significantly underrepresented among transport decision-makers, planners, and workers. Gender diversity is notably lacking in popular transport in the global South, where minibuses and two- and three-wheelers are almost exclusively operated by men. Popular transport therefore often fails to reflect and represent the needs of women, and their exclusion from transport professions limits their full participation in social and economic development. Hence, using the case of motorcycle taxi driving in Kigali, Rwanda, this research aims to address the gender gap in popular transport provision. We conducted an online survey targeting the female population of Kigali ($N = 306$). Guided by the theory of planned behavior and social norm theory, our analysis utilizes structural equation modeling to measure the extent to which women intend to become motorcycle taxi drivers and identify contributing factors. Our results show that 47.7 % of respondents are interested in this profession. This interest is primarily driven by individual factors such as attitudes and perceived behavioral control, rather than external influences and subjective norms. However, structural barriers such as safety and security concerns, domestic and familial responsibilities, and limited access to financial resources persist. It is imperative to reshape narratives and perceptions of popular transport professions within media and policy frameworks, if gender equality and women's participation in this sector are to be enhanced. Additionally, facilitating access for women to driving training programs and vehicle loans can empower them to overcome barriers and facilitate entry and advancement of women in the industry.

1. Introduction

“Gender equality is more than a goal in itself. It is a precondition for meeting the challenge of reducing poverty, promoting sustainable development and building good governance.”

– Kofi Annan

1.1. Gender inequality

Gender inequality is a matter of growing urgency in our societies,

acting as a significant barrier to both social and economic progress. It encompasses disparities in opportunities, resources, and treatment based on an individual's gender, often resulting in unfair advantages for men while constraining women's potential and well-being¹ (Ridgeway, 2011). In both the global North and global South this pervasive problem touches on various aspects of life, including training and education (e.g., Balamoune-Lutz and McGillivray, 2015; Buchmann et al., 2008), employment and income opportunities (e.g., Kwan, 2022; Martin and Barnard, 2013), access to critical health and social services (e.g., Ahinkorah et al., 2021; Hernández and Rossel, 2022), and political

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¹ While in this research we focus on gender inequality around disparities between male and female genders, it is crucial to recognize that gender is a complex and diverse spectrum, and gender inequalities can impact individuals of various gender identities, beyond the dichotomous concept of man and women.

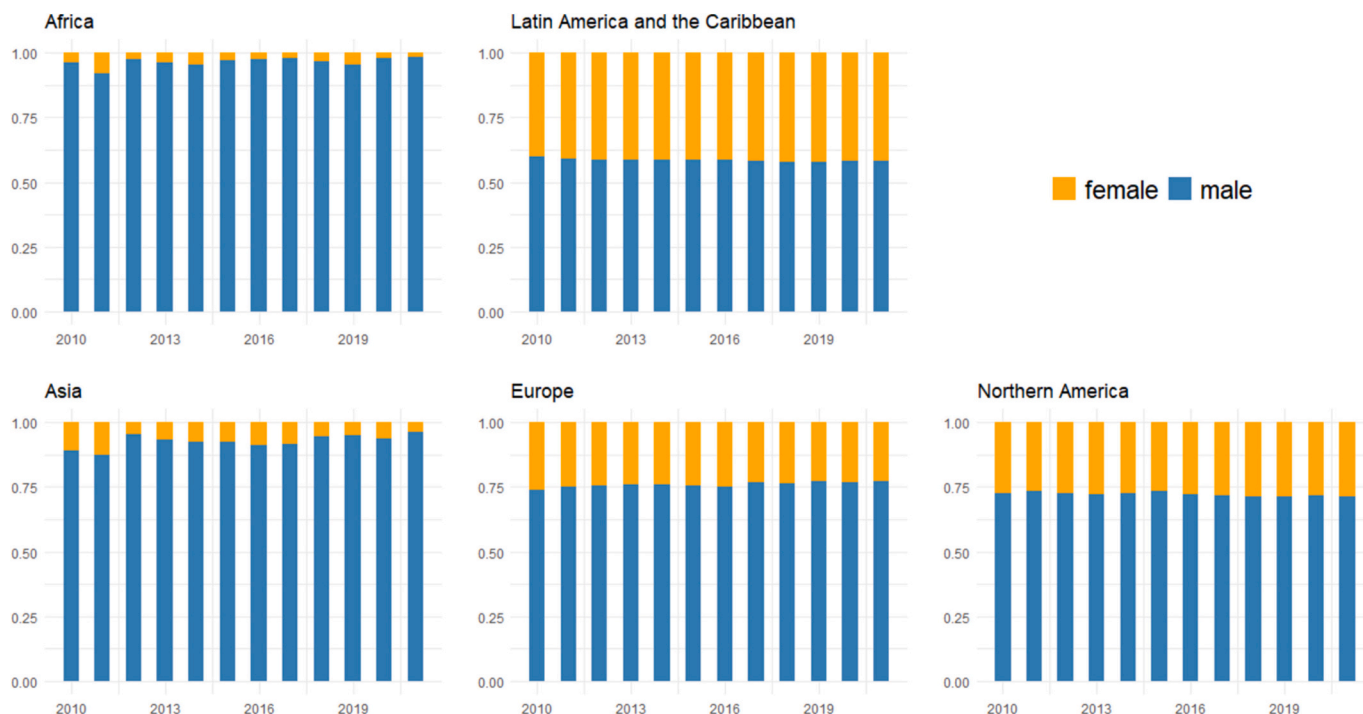


Fig. 1. Share of female workers in the transport sector.

(own illustration, note that regional aggregates are based on country availability, data from <https://ilostat.ilo.org/>)

representation and participation in decision-making processes (e.g., Homan, 2017; Funk and Gathmann, 2015). Recognizing the seriousness of this issue, the United Nations (UN) has formulated Sustainable Development Goal 5 (SDG 5) as part of its global agenda, with the aim of achieving “gender equality and empowering all women and girls” (UN, n.d.). However, despite the attention and awareness surrounding gender inequalities, the figures related to this pressing concern remain alarmingly stagnant, without sufficient progress observed in recent years, a situation exacerbated by the challenges posed by the COVID-19 pandemic (UN, 2022). According to a recent report by the World Economic Forum, at the current pace, it will take 131 years to close the gender gap and reach full parity (World Economic Forum, 2023). This highlights the need for additional action and a sustained commitment to achieving gender equality and dismantling systemic barriers, which often have profound and far-reaching consequences. For instance, unequal access to education, particularly in STEM fields, often leads to disparities in employment opportunities (Baliamoune-Lutz and McGilivray, 2015; Martin and Barnard, 2013; Struthers and Strachan, 2019). This cycle of inequality, combined with prevailing gender stereotypes, has led to the emergence of traditional men-dominated professions (e.g., blue-collar jobs) and industries in which men significantly outnumber women in the workforce.

Transport is one of these sectors. On a global scale, women make up only 16.8 % of the workforce in the transport sector according to the most recent data provided by the International Labour Organization (ILO) (cited in Sustainable Mobility for All, 2023). Significantly, there are notable regional disparities in these figures, with Latin America and the Caribbean (LAC) displaying the smallest gender gap, and Africa exhibiting the largest (Fig. 1). Moreover, women are significantly more prevalent in managerial, administrative, or service roles than in driving or operational professions (Mejia-Dorantes, 2019; Wright, 2016). Fundamentally, a combination of underlying factors creates a situation where it is very difficult for women to enter the transport sector including barriers of social norms, limited access to financial resources, inadequate training opportunities, and challenges in obtaining driver’s licenses (Leon-Himmelstine et al., 2020; Porter, 2011). Employment in

the transport sector may additionally not be compatible with care duties or professional activity at specific hours (Wright, 2019), for instance at late afternoon or in the evening. Beyond the challenge of underrepresentation, women employed in this industry often face the serious risks of gender-based violence and harassment. A study of the European Transport Federation found that 25 % of female transport workers in 24 European countries regularly experience violence (Pillinger, 2017).

1.2. Popular transport

Popular transport services² are ubiquitous in many parts of the global South, providing essential mobility services to millions of people who rely on them for their daily commute (Cervero and Golub, 2007). These services exhibit distinct characteristics: for example, i) they operate with little to no public sector regulation, ii) rely on private sector initiatives, and iii) are predominantly owned and operated by private freelancers (Hasselwander et al., 2022a). Regarding the latter, despite the increasing number of women entering the workforce in the global South (Muchie et al., 2017), the vast majority of popular transport freelancers are men. Indeed, women are significantly underrepresented among motorcycle taxi drivers, three-wheeler taxi drivers, minibus conductors, and virtually any other popular transport profession in the global South (Table 1). This gap is also found in adjacent roles and activities, such as ticket vendors, vehicle owners, station attendants, or mechanics.

The gender gap in popular transport provision is a significant obstacle to women’s economic empowerment and equal opportunities, limiting their ability to fully participate in social and economic development in their communities (Uteng and Turner, 2019). For these reasons, popular transport does usually not reflect and represent the (mobility) needs of women, which further exacerbates gender

² We agree with several researchers (e.g., Doherty et al., 2021; Klopp, 2021; Mutongi, 2017) and industry leaders (e.g., the Global Network for Popular Transportation) that “popular transport” is a much more suitable term to describe what in the scientific literature is usually referred to as “informal transport” or “paratransit”.

Table 1
Shares of female popular transport workers as reported in scientific studies.

Study area	Type of transport service	Share of female drivers (in %)	Sample size	Reference
Auchi, Nigeria	Motorcycle taxi (okada)	2.2	135	Al-Hasan et al., 2015
Cagayan de Oro, Philippines	Minibus (Jeepney)	0	428	Abuzo et al., 2017
Dar es Salaam, Tanzania	3-wheeler taxi (bajaj)	0	152	Hasselwander et al., 2022b
Delhi, India	Electric rickshaw	3.0	200	Priye et al., 2021
	Auto rickshaw	0	208	
	Cycle rickshaw	0	2012	
Hanoi, Vietnam	Motorcycle taxi (xe ôm)	2.6	76	Turner, 2020
Jabodetabek Metropolitan Area, Indonesia	Cycle rickshaw (becak)	0	192	Li et al., 2011
	Motorcycle taxi (ojek)	0	208	
	3-wheeler taxi (bajaj)	0	194	
	Minibus (angkot)	0	205	
Jakarta, Indonesia	Motorcycle taxi (ojek)	0.6	171	Medeiros et al., 2018
Kampala, Uganda	Motorcycle taxi (bodaboda)	0	37	Kisaalita and Sentongo-Kibalama, 2007
Kumasi, Ghana	Minibus (trotro)	0.6	181	Dzisi et al., 2023
Lagos and Ogun States, Nigeria	Motorcycle taxi (okada)	0	777	Ogunrinola, 2011
Lima, Peru	Bus	0.7	278	Ruiz-Grosso et al., 2014
	Motorcycle taxi	7.3	227	
Lomé, Togo	Motorcycle taxi	0	147	Diaz Olvera et al., 2016
Nairobi, Kenya	Motorcycle taxi	0	83	Martin, 2020
Nairobi and Kisumu, Kenya	Minibus (matatu) and motorcycle taxi (bodaboda)	0 (Nairobi) 7.0 (Kisumu)	116 84	Kamau, 2021
Nimba County, Liberia	Motorcycle taxi	0	70	Jenkins et al., 2020
Port-au Prince, Haiti	Minibus (tap-tap)	0	461	Oviedo et al., 2022
Total		0.6	6642	

inequalities in access to transport services (Uteng, 2021). In this context, consider also that women are mostly not involved in the planning of transport systems, vehicle design, and other related decision-making processes. For a comprehensive discussion of these aspects of gender inequalities in transport, the reader is referred to Loukaitou-Sideris (2016) and Uteng (2021). Finally, closing the gender gap in popular transport professions is imperative for addressing economic disadvantages resulting from the underutilization of women's skills and the increased costs for labor due to skills shortages (Struthers and Strachan, 2019; Toppin, 2018).

1.3. Research objective and contributions

Despite its significance, there has been limited academic interest in studying women's experiences in transport professions so far (Wright, 2016), although research attention has slightly increased in the past few years.

Most studies aim to understand the reasons for imbalances in blue-collar roles in the transport sector. Murphy et al. (2023), for example,

shows that despite the progressive legal framework in Tunisia aimed at ensuring employment equality for women, it is primarily informal barriers, such as acquiring the requisite qualifications, that hinder women from pursuing careers in driving professions. Furthermore, persistent cultural norms and domestic/familial responsibilities are identified as obstacles (ibid). Porter et al. (2023) investigated the experiences of women transport workers in Abuja, Cape Town, and Tunis, concluding that women take up employment in this sector mainly out of necessity, not by choice. However, other experiences from the global South (Bangkok, Bogota, Cape Town, Mexico City and Nairobi) suggest that transport professions harbor promising opportunities to move from informal work to new formal employment (Wright, 2019).

Some publications that focus on case studies in the European Union discuss initiatives to reduce the gender gap in the transport sector, and highlight the importance of professional networks for women that serve to acquire knowledge, foster connections, share experiences, and as sources of inspiration for exploring career opportunities within the industry (Fraszczek and Piip, 2019; Mejia-Dorantes, 2019).

The objective of the present study is to complement the existing literature, which predominantly relies on qualitative research methods, by measuring the extent to which women intend to work in men-dominated transport professions and to identify contributing and limiting factors.

Specifically, using the case of Kigali, Rwanda, we address the following questions:

- To what extent are women interested in entering the men-dominated popular transport profession of motorcycle taxi driving?
- What are the characteristics of women interested in working as a motorcycle taxi driver? What motivates them to pursue this profession?
- What specific policy interventions and actions could effectively support women in entering and thriving in the popular transport sector?

This study makes several contributions to the literature across multiple academic disciplines. It directly responds to calls for additional research on the issue of gender inequality within popular transport professions and exploring potential interventions to address this issue (Jenkins et al., 2020). By doing so, it contributes to a more comprehensive understanding of women's interest in men-dominated professions, within the transport sector and beyond. The discussion of policy interventions provides policymakers with informed insights on how to address gender inequalities in transport professions and thus create more equitable and sustainable transport systems.

The remainder of the article proceeds as follows. The next section reviews the relevant literature to develop testable hypotheses. In Section 3, we describe the data and methods used in this study. Section 4 contains the results and policy recommendations. Finally, concluding remarks and future research directions are presented in Section 5.

2. Theoretical framework

2.1. Theory of planned behavior and social norm theory

We use the theory of planned behavior (TPB) as the theoretical framework given its proven efficacy in comprehending individuals' intentions across a broad range of human behaviors (Ajzen, 1991; Hardeman et al., 2002). The theory maintains that an individual's behavioral intentions such as becoming a motorcycle taxi driver are shaped by three factors: attitude (e.g., 'What do I think about the motorcycle taxi profession?'), subjective norms (e.g., 'What do others think about the motorcycle taxi profession?'), and perceived behavioral control (e.g., 'Can I do it?'). Indeed, previous studies have found that these three constructs explain much of the variation in occupational and entrepreneurial intentions (e.g., Arnold et al., 2006; Lortie and

Castogiovanni, 2015; Munir et al., 2019; Obschonka et al., 2015; Sampene et al., 2023).

We further leverage social norm theory (Cislaghi and Heise, 2020; Coleman, 1994) to enrich the theoretical framework of this study with a deeper understanding of how the complexity of gender dynamics affect the transport sectors. Specifically, we integrate insights from social norm theory with TPB's social norm construct. Social norm theory posits that there are three conditions that form an individual's preference for a norm (Bicchieri, 2005; Blay et al., 2018). The contingency condition that a norm exists and applies to the current situation, the empirical expectations condition that a substantial subgroup of individuals adheres to the norm in comparable situations, and the normative expectations condition that a sufficiently large subgroup of individuals expects conformance to the norm in comparable situations. When all three conditions are met, an individual will express a preference for the norm – such as whether or not women are expected to work as motorcycle taxi drivers – experiencing positive utility for conformity or negative utility for nonconformity.

2.2. Literature review and hypotheses development

2.2.1. Attitude towards motorcycle taxi profession

Attitudes towards certain professions play a pivotal role in influencing career aspirations and decisions (Sampene et al., 2023). These attitudes are shaped by an individual's personal interests and their expectations regarding potential outcomes (Akosah-Twumasi et al., 2018), but they are also influenced by socio-economic and demographic factors (see 2.2.4). In the process of selecting one profession over another, individuals trade off factors such as income, independence, job satisfaction, and career growth opportunities (Douglas and Shepherd, 2002), albeit likely in a boundedly rational manner (Simon, 1990). The interplay of such attitudes and considerations comes into sharp focus when examining women's intentions to work as motorcycle taxi drivers. On one hand, although filling in gaps in bus transport services and enabling accessibility to remote areas or challenging road terrains, motorcycles and their drivers often carry a negative connotation in many sub-Saharan African countries (Diaz Olvera et al., 2016; Ehebrect et al., 2018; Martin et al., 2023b). In Kigali, Nairobi, and Kampala, motorcycle taxi drivers – or more commonly referred to as 'riders' – are often displayed in public discourses and media as young, uneducated men, disrespectful when it comes to traffic rules, and associated with high numbers of accidents and criminality (Goodfellow, 2015; Martin et al., 2023b; Rollason, 2017; Rollason, 2020). Motorcycle taxi drivers are furthermore exposed to vehicle pollution, noise, and accident risk (Diaz Olvera et al., 2016).

Previous research, nonetheless, has shown that women opt for taxi driving professions due to the financial opportunities and flexible work scheduling they offer (Beigi et al., 2020; Hiramatsu, 2022), even though it can sometimes be considered as a fallback career option (Hiramatsu, 2022; Porter et al., 2023). However, women can also make a deliberate choice to enter and persist in men-dominated professions, challenging prevailing stereotypes and prejudices. This path can lead to recognition and success, particularly if they achieve significant milestones and pave the way for other women who follow in their footsteps (Martin and Barnard, 2013).

Based on the literature, we hypothesize that:

H1. Attitude (AT) has a positive effect on the behavioral intention (BI) to work as a motorcycle taxi driver.

2.2.2. Subjective norms

The underrepresentation of women in traditionally men-dominated transport professions can to some extent be attributed to deeply ingrained social norms and patriarchal structures (Akosah-Twumasi et al., 2018; Hiramatsu, 2022; Mogaji, 2023; Wright, 2016). These norms dictate societal expectations of gender roles and responsibilities,

further reinforcing the segregation of labor based on traditional stereotypes. Mogaji (2023) elucidates that in Africa, family-owned transport businesses have traditionally followed a pattern of inheritance from fathers to sons, with women predominantly occupying supportive roles. This pattern resonates with a global trend, such as the unequal burden of unpaid care and domestic work, where women shoulder an average of 2.5 additional hours daily compared to men (Pirlea et al., 2023). While a study by Jenkins et al. (2020) reports that many women in Liberia expressed the desire to become a motorcycle taxi driver, the reluctance of businessmen to lease vehicles to women seeking employment in these fields exemplifies how societal barriers can perpetuate gender disparities. Similarly, some social connections are required, for instance, to be accepted in a waiting point organized by male drivers, which is another aspect where women could potentially be disadvantaged. Women who have already ventured into men-dominated driver professions, moreover, often face gender discrimination from male colleagues and passengers (Kwan, 2022).

As suggested in the social norm literature, strategies to change norms should focus on altering people's beliefs about what others do and approve of (Cislaghi and Heise, 2020), which can be achieved in various ways. For instance, support and encouragement from friends and family, connections with individuals already working in the desired profession (Hiramatsu, 2022), and the presence of role models can initiate normative change and significantly strengthen women's determination to pursue careers in male-dominated fields such as motorcycle taxi driving.

Based on the above findings, the hypothesis we posit is as follows.

H2. Subjective norms (SN) have a positive effect on the behavioral intention (BI) to work as a motorcycle taxi driver.

2.2.3. Perceived behavioral control

Career aspirations and decisions are furthermore influenced by the perceived ease or difficulty of a career path, which depends on factors such as an individual's past experience, the expected support, and potential obstacles (Struthers and Strachan, 2019). Providing motorcycle taxi services entails physical exertion and demands long working hours, on average 9.3 h per day on 5.8 days per week in Kigali (Bishop and Courtright, 2022). Additionally, it often requires navigating various traffic challenges and weather conditions, in the absence of separate road infrastructure, which makes it a physically and mentally demanding profession. Being a motorcycle taxi driver further necessitates both the skill to operate a motorcycle and at least a minimum of technical knowledge for basic vehicle maintenance. Men are advantaged when it comes to vehicle operation, as historically driving has often been reserved for them. This is illustrated in a pan-African survey involving 33 countries, which reveals that 2.5 times more men (27 %) have access to motorized vehicles than women (11 %) (Lardies et al., 2019). In a study investigating interests of women in men-dominated professions and vocational educational courses, Struthers and Strachan (2019) found that women are more likely to show interest when they acquire deeper insights into these fields. This involves understanding the required qualifications and prerequisites and the pathways to obtain them. However, the earlier example of women in Liberia underscores the fact that restricted access to essential financial resources poses a significant barrier for aspiring female motorcycle taxi drivers (Jenkins et al., 2020). The study also cites women who voice concerns about the insufficient support for those interested in entering the popular transport sector (ibid). In the context of Kigali, Nsengimana et al. (2019) found that the complex tax system and the fear of failure are among the barriers that hinder women from initiating entrepreneurship. Another potential barrier might be the working conditions in the popular transport sector, which often do not consider the diverse needs of all individuals, including those related to physical demands, identity, and work-life balance (Martin and Barnard, 2013; Wright, 2016). Consequently, women who perceive they cannot manage the demanding

nature of this profession, such as the long shifts, are less likely to view motorcycle taxi driving as a viable career option.

Building upon the evidence presented above, we propose the following hypothesis.

H3. Perceived behavioral control (PBC) has a positive effect on the behavioral intention (BI) to work as a motorcycle taxi driver.

2.2.4. Background factors

In addition, we expect that the interest in the motorcycle taxi profession is also influenced by some background factors such as socio-economic and demographic characteristics. Previous studies underline the homogenous profile of male motorcycle taxi drivers in Sub-Saharan Africa. They are typically characterized as fairly young, with a significant proportion aged under 30, and possessing lower educational levels, such as high school education or below (Diaz Olvera et al., 2016; Ehebrecth et al., 2018). This profile also aligns with that of female entrepreneurs in Kigali (Nsengimana et al., 2019). Moreover, it can be anticipated that interest in motorcycle taxi driving may vary depending on household composition. In sub-Saharan Africa, the overall labor force participation rate among women is 77.1 % (ILO, n.d.). However, it is not surprising that women living alone are more likely to be working, with a rate of 91.8 %, compared to women living with a family and a child under 6 years, where the rate is 72.7 % (ibid). At the same time, a study by Hiramatsu (2022) found that both age and motherhood are frequently perceived as hindrances for women when seeking for formal employment. Working as an own-account driver might thus remain an appealing career choice for some middle-aged women, as well as for those responsible for the care of minor dependents. In line with this, Porter et al. (2023) reports that the majority of female transport workers in Cape Town, for instance, are single parents.

3. Data and methods

3.1. Case study

This study focuses on the Sub-Saharan Africa region, where motorcycle taxi services are widespread and popular, and where the gender gap in the provision of these services is very significant. Specifically, we examine the case of Kigali, Rwanda, a characteristic city located in East Africa with a population of 1.7 million.

Motorcycle taxis (Fig. 2) play a significant role in Kigali's urban mobility, with 16 % of daily trips done by motorcycle taxis in 2017 (Gouldson et al., 2018; Spea Engineering and Logit, 2019) and 54 % of vehicle traffic counts (City of Kigali, 2020). This mode has experienced important growth since 2008 and is expected to further increase by 2050 (Martin et al., 2023b). Compared to other East African countries, Rwanda has a more extensive set of operational requirements such as helmets and safety vests, but also organizational requirements through the structuration in cooperatives, as well as attempts to regulate fares and request fare meters, although the latter is not yet implemented.

Despite being recognized for providing both feeder and door-to-door services, filling gaps in bus services in terms of availability, frequency,

and rapidity (Martin et al., 2023b), this sector is mostly associated in media and policy documents with a negative image of low-income young men, linked to criminality, poor road safety, and pollution (ibid). In addition, there is a significant lack of women within this sector. According to the Ministry of Infrastructure (2021), women made up only 2.6 % of the transport workforce in both 2019 and 2020, while various surveys reported only male drivers (Dusabe, 2019; Thom et al., 2020). Adding to these challenges, women face considerable barriers in accessing finance, particularly for purchasing vehicles, thus hindering their entry into this predominantly men-dominated industry (Ministry of Infrastructure, 2021).

Nevertheless, to address gender imbalances in the sector, a recent initiative supported women to become drivers of electric motorcycle taxis. The project was implemented by a combination of diverse stakeholders from the public and private sector, and consisted of five successive steps: (i) assessment of challenges for women to obtain driving licenses, (ii) driving training for women to obtain licenses, (iii) equipment of women with electric motorcycles, (iv) support to women in the industry through creation of a cooperative, and (v) identification of learnings and recommendations for future projects. In the initial pilot project, 36 women underwent motorcycle training. Among all trained women, 24 women successfully passed the driving examination and received their driver's license by the end of 2022 (Fig. 3).

The project yielded very positive results in the identification of critical success factors for the driving training and examination. Notably, the results exhibited expressions of pride. At the same time, participants identified typical barriers to becoming a motorcycle taxi driver with regard to road safety, technical and operational expertise, and working hours. In the group of 36 trained women, 22 women agreed or strongly agreed that female drivers may have concerns about becoming professionally active in an employment sector known for road safety issues, namely high rates of road accidents, while 25 agreed or strongly agreed that women may lack driving experience. In addition, 18 participants agreed that the working hours are unfavorable, and 22 said that the workload for women drivers may be too high or the shifts too long. For more background information regarding the training program, the reader is referred to Martin et al. (2023a).

Taken together, this case study therefore offers a valuable opportunity to assess the effectiveness and longevity of such programs and explore how lasting improvements can be reinforced. Moreover, the within-country case study design helps us to control for country-specific factors such as entry regulations and the quality of the institutional environment that influence informal entrepreneurship (Alnahedh and Alsanousi, 2020).

3.2. Survey design and measurement

The survey comprises two sections, shaped by insights from an extensive review of the existing literature, a pre-study, and the underpinning theoretical framework. The purpose of the pre-study was to improve the questionnaire and test its suitability to the objectives of the study. It comprised a preliminary face-to-face survey, as well as a workshop and interviews with the women undergoing the motorcycle training in Kigali (Martin et al., 2023a).

The final survey design has been collectively developed with input from all co-authors, each of whom possesses relevant expertise in the social sciences including transport and gender studies, and psychology. The survey was initially drafted in English and subsequently translated into Kinyarwanda by native speakers (i.e., the third author and another researcher familiar with the subject matter) using double translation, a rigorous method to attain semantic equivalence between the source and the target language (Dhamani and Richter, 2011).

First, in the screening question, respondents had to confirm that they were female and resided/worked in Kigali. We then surveyed the socioeconomic and demographic profile of eligible respondents such as their age, marital status, number of dependents, highest level of



Fig. 2. A motorcycle taxi waiting point in Kigali, Rwanda. (Source: authors).



Fig. 3. (a+b). Training program for female motorcycle taxi drivers in Kigali. (Source: City of Kigali)

educational attainment, and current employment status. We also asked the respondents whether they had heard about the above-mentioned training program for female motorcycle taxi drivers and whether they had ever driven a motorcycle.

The second part of the questionnaire encompassed the theoretical constructs that have been formulated based on insights gathered from the pre-study and the literature review (Table 2). The behavioral intention (BI) construct was operationalized using two items, while the remaining constructs were operationalized with four items each. Participants were asked to rate their agreement with each item on a 7-point Likert scale, ranging from ‘strongly disagree’ to ‘strongly agree’.

We also incorporated a question asking respondents to rank various barriers derived from the literature review that could hinder women from working in the popular transport sector (Fig. 4). Finally, the survey concluded with an optional open question, allowing respondents to provide any feedback (Table A1).

Table 2
Survey questions: theoretical constructs and items.

Construct	Item	Survey question
Attitude	AT1	Working as a motorcycle taxi driver is a desirable career choice for me.
	AT2	I believe being a motorcycle taxi driver can lead to good financial opportunities.
	AT3	As a motorcycle taxi driver, I can be my own boss and work flexible hours.
	AT4	Working in a men-dominated profession like motorcycle taxi driving is empowering for women.
Subjective norms	SN1	Men and women are equally responsible for care and domestic work in the household.
	SN2	Society encourages women to work in male-dominated professions like motorcycle taxi driving.
	SN3	Female motorcycle taxi drivers would be accepted by male colleagues as well as by passengers.
	SN4	People who are important to me (family, friends, etc.) would support my decision to work as a motorcycle taxi driver.
Perceived behavioral control	PBC1	I believe that I possess (or can acquire) the necessary skills and technical knowledge for working as a motorcycle taxi driver.
	PBC2	I have access to sufficient financial resources to pay for a driver's license and time to get trained.
	PBC3	I have access to sufficient financial resources to hire or purchase a motorcycle.
	PBC4	I can handle the high workload often involved in the profession of a motorcycle taxi driver, including evening hours and weekends.
Behavioral intention	BI1	I am interested in becoming a motorcycle taxi driver in the near future.
	BI2	I intend to actively pursue opportunities to become a motorcycle taxi driver in the coming months.

3.3. Data collection and sample

Primary data was collected through an online survey conducted from December 2023 until January 2024 using the LimeSurvey tool. Online surveys have become an established data collection method in the social sciences including transport studies due to their cost-effectiveness, efficiency, and the possibility to address respondents from distant locations (Lindhjem and Navrud, 2011). The anonymized nature of online surveys further helps to control for social desirability bias (Larson, 2019). This is particularly relevant for sensitive topics such as social norms and gender roles (Krumpal, 2013).

The study population comprised women aged 18–45 residing or working in Kigali. Although the focus was on younger cohorts, as they are more likely to venture into new professions, quotas were established to also include some respondents above the age of 30. While the majority of current motorcycle taxi drivers typically lack a university degree (as discussed in section 2.2.4), it is noteworthy that among the women participating in the female motorcycle taxi driving program in Kigali, 6 out of 24 are university graduates. Accounting for the anticipated interest of higher educated women in the motorcycle taxi profession, a quota of 25 % was established to ensure adequate representation in the study.

The respondents were recruited and incentivized through an online panel managed by a private market research firm. Participants were invited until the predefined quotas were met and the minimum sample size of 300 was achieved. A total of 306 valid responses from women have been collected. The socioeconomic and demographic profile of the sample is shown in Table 3. Moreover, about 70.6 % of respondents stated that they heard about the motorcycle training program for women in Kigali, while 18.0 % claimed that they have driven a motorcycle before.

3.4. Data analysis and validation

We conduct a quantitative data analysis utilizing the primary data collected through the online survey. Our approach involves a two-step process, incorporating confirmatory factor analysis (CFA) and structural equation modeling (SEM). This approach is well-established in social science research and commonly employed to examine behavioral intentions (e.g., Budnitz et al., 2024; Hasselwander and Weiss, 2024; Pak et al., 2023).

The CFA serves to test for common method bias (Podsakoff et al., 2003) and validate the measurement model in the SEM analysis on the basis of internal reliability, convergent validity, and discriminant validity (Price, 2022). SEM, on the other hand, allows us to estimate a structural model and test the hypothesized interrelations of the theoretical constructs (Fig. 5).

Following guidelines by Hair et al. (2011), we chose partial least squares structural equation modeling (PLS-SEM) over covariance based structural equation modeling (CB-SEM) as we aim to identify the key

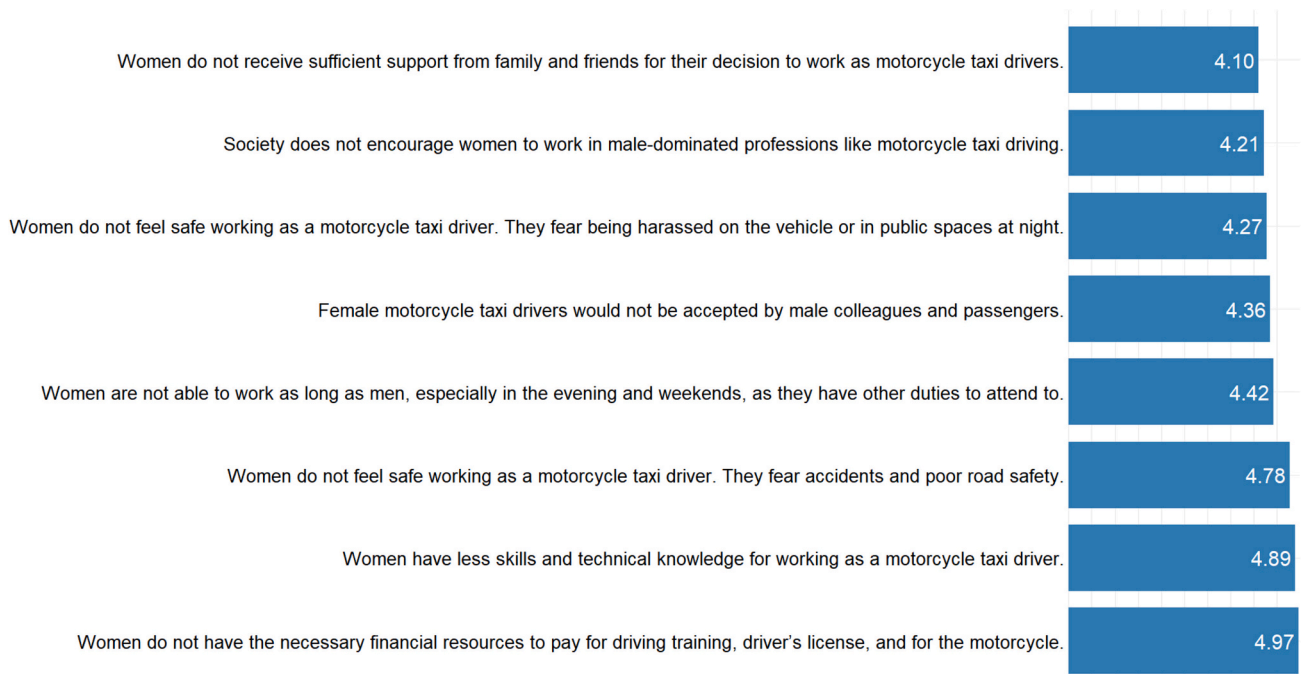


Fig. 4. Average ranking of perceived barriers for working as a female motorcycle taxi driver in Kigali. (Note that smaller values indicate more severe barriers).

Table 3 Socioeconomic and demographic characteristics of the sample (N = 306).

Variable	Description	Observations (percentage)
AGE	18–20	81 (26.5)
	21–25	97 (31.7)
	26–30	83 (27.1)
	31–35	26 (8.5)
	36–40	15 (4.9)
	41–45	4 (1.3)
MARITAL	Married	83 (27.1)
	Unmarried	214 (69.9)
	Widowed	6 (2.0)
	Separated/divorced	3 (1.0)
DEPENDENTS	No dependents	131 (42.8)
	One dependent	52 (17.0)
	Two dependents	28 (9.2)
	Three dependents	40 (13.1)
	Four dependents	26 (8.5)
	Five dependents	7 (2.3)
INCOME*	More than five dependents	22 (7.2)
	Category A: RWF 600,000 or more per month	24 (7.8)
	Category B: between RWF 65,000 and 600,000 per month	136 (44.4)
	Category C: between RWF 45,000 and 65,000 per month	56 (18.3)
	Category D: less than RWF 45,000 per month	89 (29.1)
EDUCATION	Category E: people with disability, who are unable to work or generate income	1 (0.3)
	No schooling	3 (1.0)
	Primary School	14 (4.6)
	Secondary School	213 (69.6)
	University	76 (24.8)
EMPLOYMENT	Student	73 (23.9)
	Part-time employed	98 (32.0)
	Full-time employed	48 (15.7)
	Freelancer/self-employed	30 (9.8)
	Unemployed	57 (18.6)

* 1 Ruanda-Franc (RWF) equal to 0,00072€ as of February 3, 2024.

driver constructs that explain the behavioral intention. Previous studies also found that PLS-SEM performs better for smaller sample sizes (ibid). Recommended minimum sample sizes typically range from 50 to 200 (Jhantasana, 2023), which our sample size of 306 exceeds.

Regarding the model's in-sample fit, we compute the R squared of the endogenous BI construct. To obtain t-statistics and confidence intervals for hypothesis testing, we employ bootstrapping with 10,000 resamples (Streukens and Leroi-Werelds, 2016). Finally, to assess the model's out-of-sample predictive power, we adopt the holdout-sample-based procedure PLSpredict with k = 10 folds and 10 repetitions as recommended in Shmueli et al. (2019).

Due to their theoretical relevance (see Section 2.2.4), AGE, EDUCATION, MARITAL, and DEPENDENT are included in the structural model to control for their effect on the AT and PB constructs, respectively. The variable MARITAL is coded as a binary variable, with "1" indicating a married respondent and "0" otherwise, while the remaining control variables are measured on an ordinal scale.

The R packages SEMinR and lavaan as well as IBM SPSS Statistics 26 were used to perform the analyses.

4. Results and discussion

4.1. Modeling results

Tables 4 and 5 present the results from the CFA, demonstrating evidence for the measurement model's internal reliability, convergent validity, and discriminant validity. The Cronbach's alpha values exceed the recommended threshold of 0.7 (Hair et al., 2021), indicating good internal reliability. Regarding the convergent validity, the standardized factor loadings of only three items (AT4, SN1, PBC3) are marginally below the 0.6 threshold. This provides some evidence that the single items reliably measure their latent constructs. The construct reliability is well above 0.7 for all the reflective latent constructs, indicating that the respective items within each construct are highly correlated and able to collectively measure the underlying construct (Hair et al., 2021). The values for the heterotrait-monotrait (HTMT) ratios are below 0.90 for an acceptable degree of discriminant validity (Henseler et al., 2015),

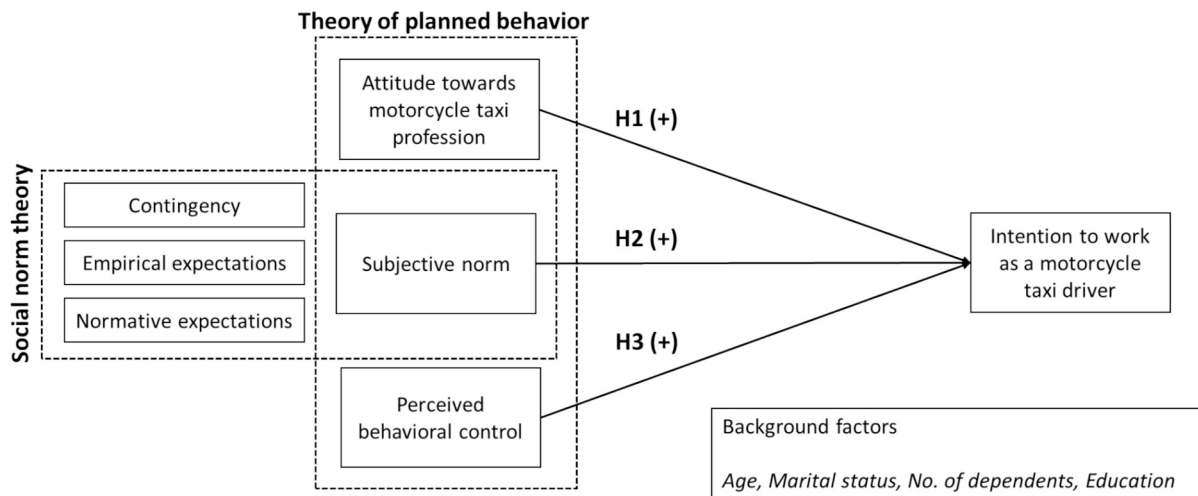


Fig. 5. Research model and hypotheses.

Table 4
Confirmatory factor analysis for construct validation.

Construct	Item	M (SD)	Alpha	SFL	CR
Attitude	AT1	4.50 (2.00)	0.76	0.71	0.96
	AT2	6.00 (1.43)		0.69	
	AT3	5.98 (1.35)		0.75	
Subjective norms	AT4	5.87 (1.47)	0.70	0.59	0.95
	SN1	6.14 (1.27)		0.59	
	SN2	6.22 (1.13)		0.65	
	SN3	5.18 (1.59)		0.60	
Perceived behavioral control	SN4	4.57 (1.74)	0.77	0.64	0.94
	PBC1	5.25 (1.93)		0.65	
	PBC2	4.53 (2.10)		0.68	
	PBC3	3.53 (2.02)		0.59	
Behavioral intention	PBC4	4.99 (1.80)	0.88	0.72	0.94
	BI1	4.23 (2.00)		0.91	
	BI2	4.84 (1.92)		0.86	

Note: M = mean; SD = standard deviation; Alpha = Cronbach’s alpha; SFL = standardized factor loading; CR = construct reliability.

Table 5
Heterotrait-monotrait ratio (HTMT) matrix.

	AT	SN	PBC	BI
AT	1.000			
SN	0.899	1.000		
PBC	0.696	0.573	1.000	
BI	0.732	0.659	0.639	1.000

confirming that the different constructs are empirically distinct from each other.

Fig. 6 presents the results from the PLS-SEM including the standardized path coefficients and item loadings, where all significant coefficients had the expected signs. The final model exhibits a robust R square value of 0.636, which can be considered a high level of explanatory power for behavioral latent constructs (Hair et al., 2011).

Although the PLS-SEM residual plots in Fig. A1 are slightly skewed, we see that the distribution of prediction errors is rather symmetric. Hence, we base our out-of-sample predictive power assessment on the root mean squared error (RMSE) metric (Shmueli et al., 2019). When using PLS-SEM to estimate the model, the indicators BI1 and BI2 have lower RMSE values (1.214 and 1.173) compared to the the naïve benchmark of a linear regression model (LM) that ignores any specified model structure based on measurement and structural theory (1.322 and 1.284). Hence, we conclude that the estimated model has high predictive power (Shmueli et al., 2019).

Moreover, we observe that specific statements (i.e., AT1, SN4, PBC4) within the three reflective constructs exhibit notably higher item loadings compared to the others. To identify whether these items exert disproportionate influence on the model results or contribute to overfitting, we conduct a sensitivity analysis. This involves systematically excluding each item one by one during model estimation and comparing how this affects the model results. Unsurprisingly, when removing these items, we observe some changes in the model coefficients as well as considerable reductions in the model in-sample fit (as low as $R^2 = 0.578$, when removing AT1). However, overfitting is unlikely an issue, since the residual distributions do not entail long left tails (Fig. A1) (Danks and Ray, 2018). Therefore, we keep the items AT1, SN4, and PBC4 in our model.

Regarding the hypothesized paths (Table 6), we thus find the following:

- AT is statistically significant ($p < 0.05$) and has the strongest effect on the BI. This suggests that measures aimed at improving attitudes towards the motorcycle taxi profession are the most promising levers to increase the share of women working in this field.
- The SN → BI path is not statistically significant ($p < 0.10$), which could be due to various reasons including weak indicator variables, model specification issues, or the true lack of relationship. In the case of the latter, this would imply that subjective norms do not influence the decision to work as a motorcycle taxi driver, for example, because external influences from social networks and family (item SN4, weight: 0.896), or community (item SN3, weight: 0.613) may not strongly affect women’s choices regarding motorcycle taxi driving. Instead, these choices would rather be driven by individual factors (such as AT and PBC, which indeed are statistically significant).
- PBC has a positive and statistically significant ($p < 0.05$) effect on the BI. This suggests that, for women who feel that motorcycle taxi driving is not within their control, supportive measures are needed to enter and persist in this profession, especially with regards to acquiring the necessary technical knowledge (item PBC1, weight: 0.668) and working on flexible hours including evening hours and weekends (item PBC4, weight: 0.943).
- AGE has a positive and statistically significant ($p < 0.05$) effect on AT, suggesting that older individuals tend to hold more positive views regarding the motorcycle taxi profession. However, it is essential to interpret this relationship cautiously due to the significant skewness in our sample towards younger demographics, which could limit the generalizability of this finding.

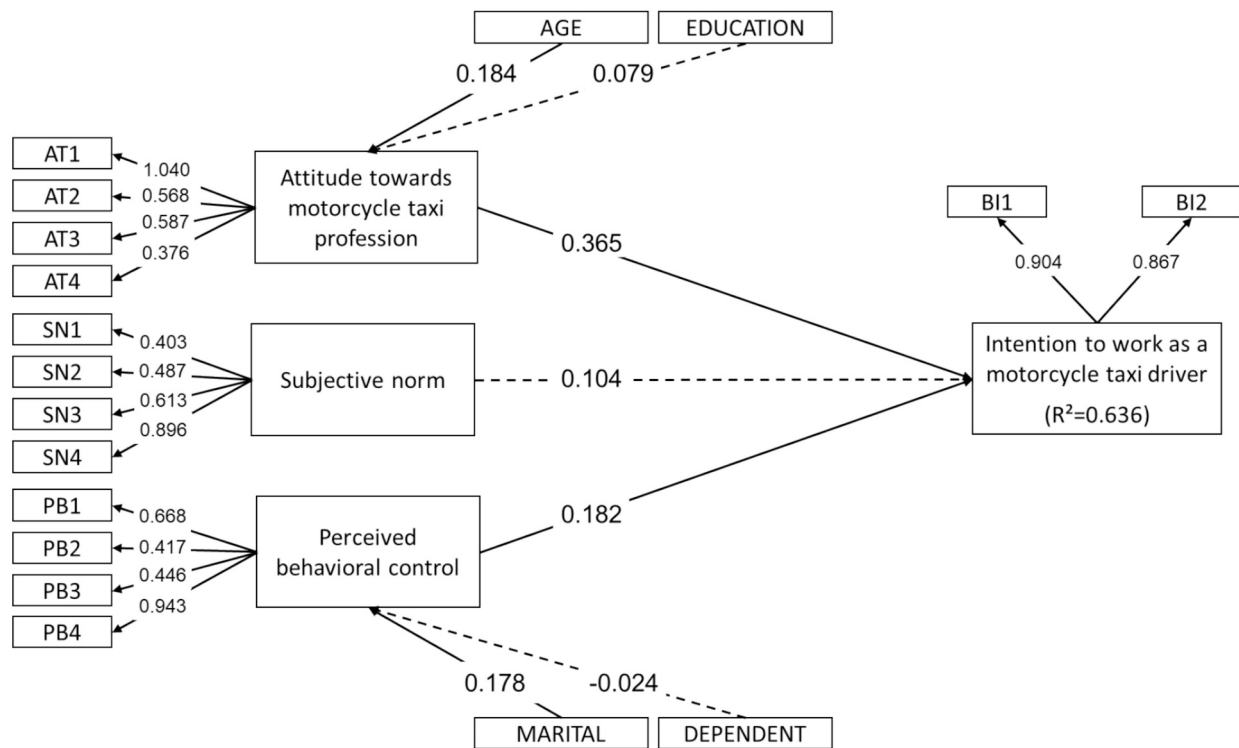


Fig. 6. Standardized path coefficients and item loadings of the final structural model. Note: Solid lines represent statistically significant ($p < 0.05$) paths, while paths with dashed lines are not significant.

Table 6 Hypotheses testing results.

Hypothesis	Path	Beta	t-value	2.5 % CI	97.5 % CI	Result
H1	AT → BI	0.365	2.998	0.182	0.825	Supported
H2	SN → BI	0.104	1.060	-0.137	0.429	Not supported
H3	PBC → BI	0.182	2.501	0.046	0.408	Supported
	AGE → AT	0.184	3.494	0.081	0.288	Supported
	EDUCATION → AT	0.079	0.915	-0.085	0.255	Not supported
	MARITAL → PBC	0.178	2.082	0.013	0.350	Supported
	DEPENDENT → PBC	-0.024	-0.324	-0.174	0.121	Not supported

- EDUCATION does not have a significant effect on AT. The hypothesis that attitudes towards the motorcycle taxi profession decrease with higher educational backgrounds can therefore not be confirmed.
- The MARITAL → PBC path is significant, suggesting that married women have more likely the perception of being able to work as a motorcycle taxi driver. A possible explanation is that they thereby have easier access to loans and vehicle ownership, and more support from the families' networks.
- DEPENDENT, on the other hand, does not have a significant effect on PBC. Nevertheless, the negative coefficient provides some weak indication that a higher number of dependents could indeed impair women's perception of being able to work as a motorcycle taxi driver.

4.2. Policy implications

The results of our analyses hold important implications for policy-makers and transport planners in their efforts to enhance female representation within the popular transport sector.

Most importantly, despite motorcycle taxis often carrying a negative connotation, our findings reveal a substantial level of interest in this profession among the sampled women, predominantly shaped by individual factors such as attitudes and perceived behavioral control, rather

than external influences and subjective norms. This leads to two implications. First, the gap in perception between the surveyed women and typically negative mainstream narratives found in media and policy documents calls for critical distance and questioning of the validity of such representations. Second, since attitude has the strongest effect on behavioral intention, fostering positive attitudes towards the motorcycle taxi sector may represent an effective lever to increase the involvement of women in this industry. Such efforts should focus on reshaping narratives and perceptions within media and policy frameworks, highlighting the positive contributions made by motorcycle taxis to society and livelihoods. This involves both the recognition of societal benefits such as accessibility enabled by motorcycle taxis due to the limitations of public transit options (e.g., limited geographical coverage, crowded vehicles, or waiting times) and unpaved or uneven terrains, as well as the recognition of socio-economic development through revenues secured by drivers for themselves and dependents. The confusion between petty criminals using motorcycles and regular motorcycle taxi drivers should be questioned. A more inclusive policy agenda could lean on existing motorcycle taxi cooperatives, a distinct trait in Rwanda's motorcycle taxi policy environment, and strive to improve their integration into transport planning. Policy interventions could support the recognition of dedicated waiting point areas near public transport hubs – mostly tolerated but neither officially recognized nor planned – or the

creation of safe parking bays to pick or drop clients, which could mitigate current patterns of looking out for customers while riding, a practice entailing road safety risks.

Moreover, addressing perceived behavioral control requires a multifaceted approach aimed at empowering women, especially those that are unmarried and with familial duties, to navigate the challenges of motorcycle taxi driving in cities like Kigali. As the first pilot in Kigali has shown, providing access to comprehensive driving training programs can equip women with essential skills and driving confidence. Formalizing employment arrangements can offer job stability and security, while support in developing business skills, such as language proficiency and navigation map usage, can enhance operational efficiency. Establishing female cooperative structures can foster solidarity and mutual support among women in the sector. Beyond the segment of driving, policy interventions may further implement measures to support women in entering and sustaining other activities related to the broader motorcycle taxi ecosystem. This includes promoting the potential for women to pursue careers in STEM fields as technicians in charge of assembly, maintenance, repairs, or charging batteries for electric models. Initiatives such as scholarships and fairs can provide crucial support to women seeking involvement in these areas, fostering greater diversity and inclusivity within the sector.

Exploring alternative business models may help mitigate concerns and limitations associated with evening hours: currently, all drivers are self-employed and work long hours, including in the evening or at night. This represents a significant barrier for many prospective female drivers, who are typically more responsible for family care duties in late afternoon and early evenings, as well as a safety risk since operating at dark increases harassment and violence risks. Alternative models currently tested in Nairobi, Kenya, where drivers are employed by a digital platform provider and the motorcycle shared between different drivers, may lower the pressure to operate at late hours, make provisions for caregiving responsibilities, limit risks and facilitate women's participation in the profession. Additionally, facilitating access to finance for vehicle purchase can remove financial barriers and enable individuals to enter and thrive in the motorcycle taxi industry.

Taken together, the pilot project in Kigali, from which the current study derives, represents a promising first step towards increasing the share of female drivers in the popular transport sector. However, to ensure lasting progress in addressing gender disparities, additional effort and replication of such initiatives are essential. Future policies should aim to build on this foundation by scaling up training programs, fostering supportive work environments, and exploring innovative business models that address the unique challenges women face in this profession.

4.3. Research limitations

Although we implemented several validation and robustness checks, we must acknowledge three limitations related to our data. These limitations may impact the overall robustness of our findings and, consequently, the strength of our policy recommendations.

First, the representativeness of the study population could not be fully ensured. While we aimed to target women more likely to explore new professions and set quotas for specific demographic groups, such as women over 30 and those with a university degree, limitations in the sampling approach impacted our ability to achieve a fully representative sample. Consequently, certain socioeconomic and demographic factors may not be adequately captured, which could affect the generalizability of the findings. Additionally, the use of an online panel may have excluded certain demographic groups, such as women with limited internet access or lower digital literacy.

Second, while most items demonstrated strong factor loadings, three items (AT4, SN1, PBC3) had standardized loadings marginally below the 0.6 threshold, which may indicate that these items do not fully represent the constructs they were meant to render measurable. Although this

could introduce some minor concerns regarding construct validity, we kept these items to preserve theoretical completeness, while additional robustness tests were conducted to confirm the model's predictive validity.

Third, although our results indicate a strong interest in the motorcycle taxi driver profession, we have to mention the imperfect correlation between stated intentions and actual behaviors. While respondents may express interest or intent, unforeseen real-world factors can influence their actual decision to enter the profession. This intention-behavior gap is well-documented in the literature and should be considered when interpreting our findings (Sheeran and Webb, 2016). The positive picture could furthermore be biased by an underestimation of the challenges and responsibilities inherent in this profession. Learnings from the pilot project showed that societal and family practices are sensitive topics; talking about limitations related to the household, such as the degree of acceptance by male members of the woman's activity, or physical limitations, for instance linked with women's periods, require safe environments and sufficient time to be unfolded.

5. Conclusion and future research directions

This study examined women's intentions to enter men-dominated professions, focusing on the case of motorcycle taxi drivers in Kigali, Rwanda. Drawing on the Theory of Planned Behavior and Social Norm Theory, we conducted an online survey of women in Kigali, yielding 306 valid responses. Almost half of the respondents (47.7 %) expressed interest in becoming a motorcycle taxi driver in the near future, scoring 5 or higher on the 7-point scale for the respective question (BI1). Using partial least squares structural equation modeling (PLS-SEM), our analysis revealed that this interest is primarily driven by individual factors such as attitudes and perceived behavioral control, rather than external influences and subjective norms. Based on these results, we present a comprehensive discussion on policy recommendations to address gender inequalities in the popular transport sector and increase the share of women in this domain.

Future research could focus on mitigating the limitations encountered in this study. For example, sampling techniques such as stratified random sampling can be used to ensure a more diverse and representative population, capturing a broader range of demographic and socioeconomic factors. Additionally, using a mix of online surveys and face-to-face interviews could help include participants with limited internet access or lower digital literacy, enhancing the inclusivity and reliability of the findings.

To address potential measurement errors in future research, alternative theoretical frameworks could be explored, such as the Social Cognitive Theory (Schunk and DiBenedetto, 2020) or the Self-Determination Theory (Deci et al., 2017). Additionally, refining item wording or incorporating formative measurement models could improve the precision of item loadings and enhance overall construct validity.

Regarding the intention-behavior gap, there is an opportunity to gather data from individuals who have firsthand experience with this profession, as similar initiatives to the Kigali pilot emerge and more women venture into the popular transport sector, thus enriching our understanding of the dynamics involved. We also recommend exploring alternative quantitative methods such as necessary condition analysis (NCA) (Dul, 2016) to complement the findings of this study. Additionally, qualitative methods, including interviews and focus groups, could provide deeper insights into the motivations, challenges, and experiences of women involved in the motorcycle taxi driver profession. These qualitative methods seem more appropriate to address sensitive topics linked to societal or family practices.

Further investigation into women's security perceptions is essential, as fear or feeling insecure – particularly due to the close physical proximity involved in motorbike sharing – could greatly affect women's attitudes towards pursuing this profession (cf. Fig. 4). We also

recommend comparing our results with women's interest in other professions within the popular transport sector, such as driving minibuses, which comes with different requirements and challenges compared to motorcycle taxis.

Finally, the existing literature on gender topics in popular transport professions, including this study, has predominantly centered on case studies in Africa (e.g., Jenkins et al., 2020; Mogaji, 2023; Murphy et al., 2023; Porter et al., 2023). However, as the gender gap in these professions is a global phenomenon, empirical evidence from other world regions is essential to foster a more comprehensive understanding of how this imbalance can be addressed across diverse cultural and socio-economic contexts. In particular, case studies from Asia and Latin America merit additional attention to inform more effective strategies for promoting gender equity in popular transport sectors worldwide.

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CRediT authorship contribution statement

Marc Hasselwander: Writing – original draft, Visualization, Software, Methodology, Formal analysis, Data curation, Conceptualization.

Appendix

Emilie Martin: Writing – original draft, Conceptualization. **Liberata Mukamana:** Writing – review & editing, Validation, Conceptualization. **Viktoriya Kolarova:** Writing – review & editing, Methodology. **Naomi Mwaura:** Writing – review & editing, Validation, Conceptualization. **Tim Schwanen:** Writing – review & editing, Supervision, Methodology, Conceptualization.

Declaration of competing interest

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

Data availability statement

Data will be made available on reasonable request.

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Table A1

Selected feedback from respondents of the online survey.

“My opinion is that women should be trained so that the first ones to take up the project of driving a motorcycle will be a gateway for others and they will do well in the profession so that others will find that they have chosen the way.”
“Women should be supported by their families and understand that riding a motorcycle is not something that only men can do.”
“The government should encourage and help women who want to develop themselves.”
“Encourage girls especially to start learning how to drive in order to combat homelessness and unplanned pregnancies”
“What I would like to add is that girls and women should be brave enough to feel that there is no job that we are excluded from even driving a motorcycle taxi.”
“Driving motorcycles and cars is a skill that helps you achieve developmental goals. What a man can do, a woman can do too. Therefore, women should be allowed to engage in driving motorcycles and cars.”
“Women should be helped to understand how they can benefit from learning to drive motorcycles.”
“Women or girls with intelligence and skills to perform any job are everywhere. What's needed for this to happen is to be given opportunities for education and the necessary trainings, as well as the right support. Moreover, those who doubt the capacity should not discourage us because they are just not aware, let's have the courage to say we got this!”
“What I feel is that organizations like motorcycle drivers' associations should train and provide motorcycles to women, rather than companies providing them directly, to help empower women who want to work in this sector.”
“It would be great if we could see examples of women working as motorcycle taxi drivers in pictures or in visible actions. Moreover, I would like people to be trained without feeling that being a driver is exclusively for men.”
“Encouraging women to venture into motorcycle riding is beneficial as it contributes to the well-being of the family and the overall development of the country.”
“I want girls under 30 years old to be given the opportunity to work as motorcycle taxi drivers, to receive support, and to ensure their safety during night shifts.”
“Training programs to support women in motorcycle taxi driving should be established in every region.”
“Men should support their wives in household chores while they go out to work as motorcycle taxi drivers.”

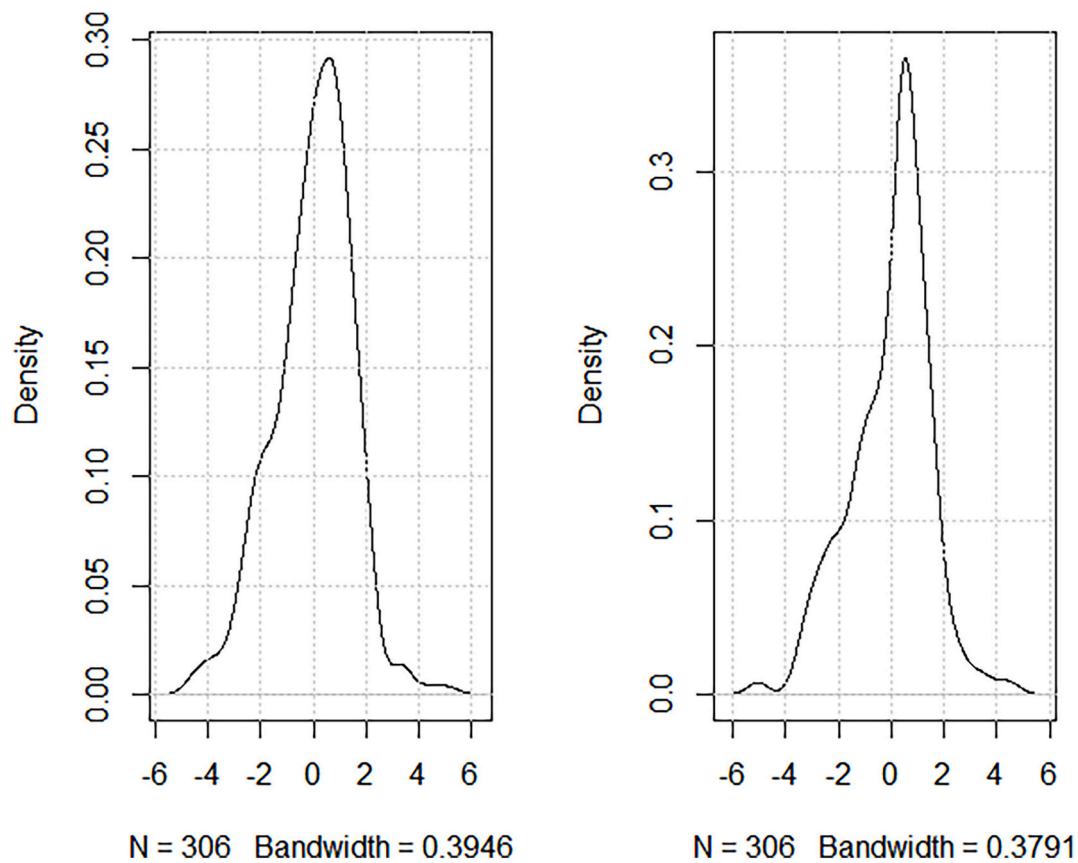


Fig. A1. PLS-SEM residual plot of indicators BI1 (left) and BI2 (right).

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