

Is ride-hailing a step closer to personal car use? Exploring associations between car-based ride-hailing and car ownership and use aspirations among young adults

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ABSTRACT

New and emerging ICT-mediated mobility services, such as ride-hailing, are shaping travel behaviours with profound implications for sustainable urban transport and mobility. Despite the growing literature on ride-hailing's impact on travel behaviour, there is a dearth of evidence on the possible influence of this relatively new form of car-based transport on car ownership and use aspirations, and future travel behaviour. We address this gap in the literature by answering the question: *does car-based ride-hailing explain aspirations for private car-based transport among young adults?* We mobilise a conceptual model that accounts for the possible influences on car ownership and use aspirations of individuals' perceived similarities between ride-hailing and private car use; perceived benefits of ride-hailing; attitude toward car ownership and use; attitude toward the environment; as well as socio-demographic attributes. We test this model empirically in a developing country context where there is a growing use of car-based ride-hailing services, especially among young demographics. We found that individuals perceived close similarities between car-based ride-hailing and private car use, and that attitude toward car use (instrumental aspects) and perceived benefits of ride-hailing had a direct positive influence on their perceptions. Car ownership and use aspirations were strongly underpinned by individuals' experience using car-based ride-hailing as well as the social-symbolic meaning of the private car. We also found a dissonance between individuals' pro-environmental attitude and their desire for car ownership and use. We conclude that ride-hailing is fulfilling an immediate preference for car-based transport among our study participants. Car-based ride-hailing could therefore be a step closer to realizing personal car ownership and use aspirations. We reflect on the implications for creating sustainable urban transport and mobility futures.

1. Introduction

App-based, ICT-mediated mobility services have emerged with disruptive consequences for urban transportation systems as well as shaping individual travel behaviours. Ride-hailing or ride-sourcing, a relatively new form of transport, typically car-based and motorcycle-based, is the most common app-based mobility service being utilised by individuals to meet diverse travel needs in urban areas. Consequently, there is a growing research interest in understanding ride-hailing's travel behaviour impacts. The main strands of research in this area have included understanding user adoption behaviour (e.g. [Thai-thatkul et al., 2023](#); [Waluyo and Irawan, 2022](#); [Acheampong et al., 2020](#);

[Grahn et al., 2019](#); [Dias et al., 2017](#); [Lavieri and Bhat, 2019](#)) and ride-hailing's interaction with public transport systems (e.g. [Cats et al., 2022](#); [Doppelt, 2018](#); [Circella and Alemi, 2018](#)); individuals' mode substitution behaviours in the presence of ride-hailing (e.g. [Shi et al., 2021](#); [Tirachini, 2020](#); [Acheampong et al., 2020](#); [Henao and Marshall, 2019a](#); [Tirachini and del Rfo, 2019](#)); and ride-hailing's influence on safety and security ([Liu et al., 2022](#); [Nguyen-Phuoc et al., 2021](#); [Acheampong, 2021](#); [Tang et al., 2021](#)).

The question of how ICT-mediated mobility services such as ride-hailing can contribute to reducing car ownership and use toward long-term urban sustainability imperatives remains central to on-going research. The emerging evidence suggests that ride-hailing replaces

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private car use in certain instances, albeit the effect tends to be marginal (see e.g. Acheampong et al., 2020; Henao and Marshall, 2019a). People do not give up their car entirely for ride-hailing. On the contrary, Acheampong et al., (2020) found that people with car-dependent lifestyles tended to use ride-hailing more, controlling for other factors. Azimi and Jin (2022) also found that being a fan of private vehicles significantly reduced the likelihood of using ride-sourcing services, especially among those who never had the experience of using this form of mobility. Previous research has also found that ride-hailing induces new journeys—journeys that would not have occurred at all if not for the availability of this form of transport (Alemi et al., 2018; Rayle et al., 2016). In addition to not having a significant impact on private car use, ride-hailing offers a car-based alternative for predominantly lone-journeys (Acheampong et al., 2020; Gehrke et al., 2019; Lavieri and Bhat, 2019; Henao and Marshall, 2019b) implying that its everyday usage contributes to overall car use.

Understanding ride-hailing's impact on car ownership and use is crucial to anticipating its broader urban sustainability impact in the future. We argue in this paper that it is even more crucial to explore and understand ride-hailing's impact on private car ownership and use beyond what individuals' revealed choices and preferences could tell us today. We recognise that there is a longstanding interest in understanding car ownership aspirations especially among younger populations (see e.g. Hopkins et al., 2021; Meena et al., 2021; Zhou and Wang, 2019; Verma et al., 2017; Zhu et al., 2012). Yet, despite the empirical evidence that has accrued in this area of research, there is limited understanding regarding the role that new transport technologies and mobility services plays in shaping individuals' preferences for car ownership and use. Exploring questions of car ownership and use aspirations in the context of ride-hailing as a relatively new and ubiquitous mobility service therefore presents an opportunity to address this gap in the literature.

Furthermore, one group of individuals that have received significant attention in travel behaviour research in general, and car ownership and use aspirations, in particular, are young adults. Young adults are leading agents of demographic changes in society and their commuting habits could shape the future travel trends within cities (Xiong and Zhang, 2016; Smith and Sage, 2014; Polzin et al., 2014). Research has found that young adults tend to use app-based mobility services more (e.g. Sabogal-Cardona et al., 2021; Acheampong et al., 2020; Alemi et al., 2018; Rayle et al., 2016), implying that ride-hailing is already shaping the travel habits of this demographic. In addition, we know that among young people, socialisation processes in everyday travel decisions such as mode choice are important determinants of aspirations to replicate practices of auto-mobility (Hopkins et al., 2021). For example, one of the critical influences of car ownership and use in later life, is family car ownership and car use while growing up as a young adult. With the advent of flexible, on-demand car-based ride-hailing, however, we argue that young adults are being introduced to car-based transport in new ways that require further research in order to fully understand emergent habits and behaviours and their implications for future car ownership and use.

The central question addressed by this paper therefore is: *What if, by being introduced to car use in early adulthood through ride-hailing, younger adults would want to own and use a car in the near future?* In other words, *does car-based ride-hailing explain aspirations for private car-based transport among young adults?* In the context of our study, our analysis is driven by the conceptualization that 'ownership' and 'use' of the car are inextricably linked, such that the 'aspiration to own' cannot be separated from the 'aspiration to use'. Thus, 'ownership' and 'use' aspirations are combined into the single latent outcome variable 'car ownership and use aspirations' to capture individuals desire to own and use a car to meet their travel needs, similar to what they are currently doing with car-based ride-hailing. In other words, the construct 'car ownership and use aspiration' is adopted in this study to reflect our respondents' perception of the value of the car as a necessary mode of travel in the near future

and the underlying reasons. It worth clarifying that the current paper does not measure actual usage behaviour associated with the car, which we consider as a long term observable behaviour that goes beyond our immediate focus in the current paper on aspirations.

To this end, we examine the association between ride-hailing use and car ownership and use aspirations among young adults in Ghana, sub-Saharan Africa, where major Transportation Network Companies (TNCs), such as Bolt and Uber are providing car-based ride-hailing services in urban areas. Thus, our investigation is based in a context where car ownership is relatively lower and informal *para*-transit constitutes the dominant public transport mode. Meanwhile ride-hailing has emerged in recent years as the single most important means by which individuals, young adults, in particular, experience car use.

Therefore, our main contributions to the literature with this paper is accruing new empirical insights into the role of car-based ICT-mediated mobility services in shaping car ownership aspirations and the implications that this will have for future car use. Ultimately, we also aim to contribute to travel behaviour theory by mobilising and empirically testing a framework that could be relevant to examining travel behaviour changes in the context of new and emerging mobility services.

The remainder of this paper is organised as follows. Following this introduction, we review and draw on the existing literature to mobilise a conceptual framework that was tested empirically. Next, we outline our methodology in section 3 and present the results of the data in section 4. The key findings are outlined and discussed in section 5, followed by our conclusions and directions for future research.

2. Literature synthesis and conceptual framework

Among the factors that distinguish ride-hailing from other alternative travel modes and influence user behaviour is its perceived benefits or usefulness (Elnadi and Gheith, 2022; Acheampong et al., 2020; Kim et al., 2019; Min et al., 2019; Weng et al., 2017). As a construct within the original Technology Acceptance Model (TAM) (see Davis, 1989; Venkatesh and Davis, 2000), a number of previous studies have found that perceived benefits influence attitudes, and explain why individuals use or would want to use ride-hailing (e.g. Elnadi and Gheith, 2022; Acheampong et al., 2020; Kim et al., 2019; Min et al., 2019; Weng et al., 2017). Elnadi and Gheith, (2022) found perceived usefulness to be positively associated with attitudes towards car-based ride-hailing and intentions to (re)use the service among users in Egypt. Similarly, Kim et al., (2019), in their study of consumer intention to use on-demand automobile-related services found that individuals' perception of benefits positively influenced use intentions. Moreover, Acheampong et al., (2020) found that relatively younger people and individuals with pro-car ownership attitudes were more likely to indicate that ride-hailing services would be beneficial. In this study, we deploy perceived benefits to capture individuals' perception of the utilitarian benefits of ride-hailing, such as convenience, reliability, flexibility and travel time savings, based on their experience using this mobility service.

Previous research has established the important role that attitudes—an individual's expectation of the outcomes of an action or behaviour and the personal values that are attached to them (Ajzen, 1991; Sutton et al., 2003)—play in explaining travel choices and aspirations. Attitude towards car ownership in this study refers to the rational and instrumental aspects of the car as perceived by the individual, such as believing that the car is more reliable, accessible, safe, fast and provides access to more destinations than alternative modes (Gatersleben, 2011; Hiscock et al., 2002; He and Thøgersen, 2017). In a meta-analysis of the psychological determinants of car use, Gardner and Abraham (2008), found that attitude to car use demonstrated a moderate effect. In light of these insights, we hypothesize that individuals' perception ride-hailing benefits will correlate with their attitude toward car use [H1]. Both constructs measure the rational and instrumental values individuals attach to the respective car-based modes (i.e. ride-hailing and private car ownership and use).

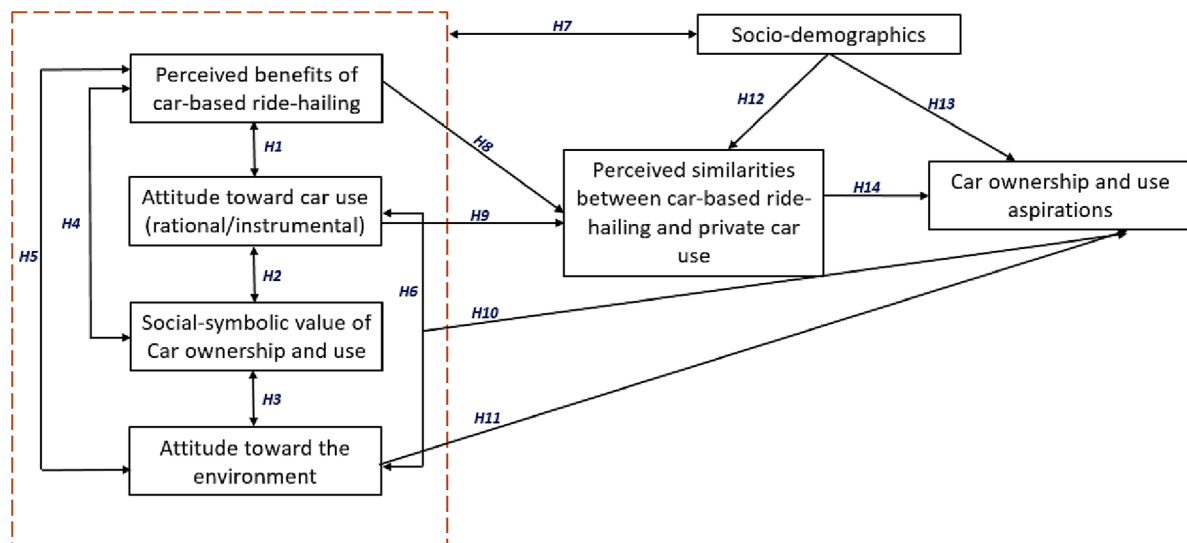


Fig. 1. Conceptual model showing constructs and hypothesized relationships (Note: double-headed arrows show hypothesized covariation while single-headed arrows show direct explanatory effect).

Social-symbolic values are as important as the instrumental and rational aspects in explaining car ownership. Social symbolic aspects or status values reflect the cultural meaning of automobility (Gartman, 2004). They are related to people's desire to express their social identity and status through car use (Gatersleben, 2011; Gatersleben, 2007). For example, cars are seen to confer prestige (Hiscock et al., 2002) and status (Mann and Abraham, 2006). Gartman (2004) argued that status symbol as an underlying socio-cultural logic of car ownership changes over time, and might be valid for only a specific historical period or age. The evidence, however, suggests that these psychosocial and social-symbolic valuations of car ownership and use are still prevalent in different cultural contexts (Verma et al., 2017; Zhu et al., 2012; Goetzke and Weinberger, 2012; Zhu et al., 2012). In view of the evidence, we hypothesize that social-symbolic values will correlate positively with instrumental aspects of car ownership and use [H2] and the perceived benefits of ride-hailing as a car-based transport [H3]. Moreover, social-symbolic value of the car is expected to have direct influence on car ownership and use aspirations [H10].

Moreover, environmental awareness and concerns have been found to partly explain mobility choices (see e.g. Acheampong and Siiba, 2020; Clark et al., 2016; Flamm, 2009; Gardner and Abraham, 2008). Households with pro-environmental attitudes own fewer and more fuel-efficient vehicles (Flamm 2009). Clark et al. (2016) showed that people with pro-environmental attitudes were more likely to switch away from car commuting. Gardner and Abraham (2008), in a meta-analysis of previous studies found that awareness of the concomitant environmental and health problems of car use yielded a small to medium-sized negative effect on driving. We therefore hypothesize that attitude toward the environment will correlate with perceived benefits of ride-hailing [H4], attitude toward car ownership and use [H5] and the social-symbolic value of the car [H6]. Environmental attitude is also expected to have a direct influence on car ownership and use aspirations [H11].

In addition to the aforementioned constructs, for the purpose of this study, we introduce the 'perceived similarity' between owning a car and car-based ride-hailing as a new latent variable (Fig. 1). The construct, 'perceived similarity' has originally been widely used in the social-psychology literature to explain attraction in the context of interpersonal and intergroup relationships. Montoya et al. (2008p.890), defined perceived similarity as "the degree to which one believes oneself similar to another." The literature in this field shows a strong positive association between perceived similarity and interpersonal attraction (see e.g.

Ensher and Murphy 1997; Hoffner and Buchanan, 2005; Montoya et al., 2008; Grigoryan, 2020; Hughes et al., 2021). Drawing on this definition, in this study, we deploy 'perceived similarity' to capture the degree to which individuals believe car-based ride-hailing shares similar attributes with private car ownership and car use. Specifically, the construct is used to elicit the extent to which individuals perceive that the instrumental, convenience-based aspects of the private car are similar to those of car-based ride-hailing. In view of this, we hypothesize that the perceived benefits of car-based ride-hailing and instrumental attitude towards ownership and car use will have direct explanatory effects on the perceived similarity between car use and ride-hailing [H8, H9, respectively]. In addition, we hypothesize that the perceived similarity between car use and ride-hailing will have a direct explanatory effect on car ownership and use aspirations [H14].

In this study, we are interested in exploring individuals' desire to own a car and to use it to meet their travel needs in the way that they are currently using car-based ride-hailing. Thus, in the conceptual model, car-ownership and use aspirations, the outcome variable, is a goal-directed behaviour that reflects individuals' desire or ambition to both own a car and use it to meet their travel needs. It is important to clarify that we do not directly measure aspects of car use behaviour such as travel distance, frequency and purpose of usage because the present study addresses aspirations rather than actual usage behaviour.

Lastly, socio-demographic variables such as age, gender and income are known to influence travel behaviour (Zhu et al., 2012; Belgiawan et al., 2016; Zhou et al., 2019). In view of this, we hypothesize that socio-demographic will covary with the latent explanatory constructs [H7], and also have a direct explanatory effect on perceived similarity between ride-hailing and car use [H12] and car ownership and use aspirations [H13]—(Fig. 1).

3. Methodology

3.1. Case study and survey questionnaire design

The conceptual framework outlined in the previous section guided the empirical inquiry for this study, which was conducted in Ghana's two major cities, Accra, the capital and Kumasi the second largest city. The case study presents a unique context to explore the association between ride-hailing use and car ownership aspirations for two main reasons. Firstly, Accra and Kumasi are two of the major cities in Sub-Saharan Africa where major TNCs, including Uber and Bolt (formerly

Table 1
Characteristics of the survey respondents (n = 1868).

Locations	Accra: Kumasi	75%: 26%
Gender	Female: Male	44%: 56%
Age	18–23	63%
	24–29	28%
	30–35	9%
Employment	Full-time: Part-time: Student (university)	16%:12.3%:72%
Income (Ghana Cedi) (n = 617) ¹	≤900	40%
	901–1500	25%
	1501–2500	18%
	2501–3500	11%
	>3500	7%
Driver licensure	Yes: Provisional: No	19%:8%:74%
Car ownership	I have a car	7%
	I DON'T have my own car, but there is at least one car in my household I can use	30%
Ride-hailing use 7 days prior to survey	None of the above applies to me	63%
	None	35%
	At least twice	35%
	3–5 times	25%
Self-reported ride-hailing use pattern	5–7 times	4%
	A few times in a month	39%
	Occasionally in a month	46%
Ride-hailing usage (vehicle occupancy)	Ride-hailing is the main way I move around	15%
	I ALWAYS travel alone as a passenger in the vehicle	20%
	I MOSTLY travel alone as a passenger in the vehicle	51%
	I SELDOM travel alone as a passenger in the vehicle	19%
Most recent ride-hailing trip purpose	I NEVER travel alone as a passenger in the vehicle	10%
	Commute (work or school-related)	55%
	'Special occasion' trips	31%
	Other trip purposes	14%
Substituted mode (most recent trip)	Private car	10%
	Public transport (Trotro)	40%
	Public Transport (BUS)	5%
	Taxi (conventional)	40%
	Walking	2%
	Motorcycle	1%

¹ This represents a sub-sample of the total respondents who were employed and reported their income.

Taxify), have been providing app-based ride-hailing services for over half a decade now (Agyemang, 2020; Boateng et al., 2022). Currently, over ten ride-hailing companies, both local and multinational, operate in Accra alone, where there is a huge unmet demand for reliable transport (Pasquali et al., 2022). Findings of earlier research in these two cities suggest a growing use of ride-hailing services, especially among the young, highly educated and high-income demographics (see e.g. Acheampong et al., 2020; Ackaah et al., 2020). Secondly, Ghana represents a typical developing country at the early stages of motorization where car ownership is also relatively lower, albeit rising in recent years. Public transport in urban areas is mainly provided by informal, unscheduled paratransit (known locally as Trotro) and, to a lesser extent, traditional shared taxis that are characterised by overall poor service quality and lax safety standards (Esson et al., 2016; Amoh-Gyimah and Aidoo, 2011). Thus in this context, ride-hailing has emerged not only as a new and innovative alternative offering flexible on-demand mobility, but also as a new way by which a section of the population, particularly young adults, can now access car-based transport.

We designed a structured survey questionnaire that translated the constructs of the conceptual model (Fig. 1) into questions for the study participants. In this study, we were only interested in individuals who have used an app-based ride-hailing service. Thus at the beginning of the survey, respondents were asked to indicate if this was the case for them.

Table 2
Descriptive summary of responses to items (%) grouped under their respective latent variables.

Latent variables and their indicators/items	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
PBR Perceived benefits of ride-hailing (Cronbach's Alpha $\alpha = 0.954$)					
PBR1 Ride-hailing makes travel flexible	8	4	20	42	26
PBR2 Ride-hailing is a convenient way of travelling in my city	7	5	22	40	25
PBR3 Ride-hailing is a faster travel option	7	7	26	36	25
PBR4 Ride-hailing is reliable	7	6	25	39	23
PBR5 Ride-hailing is safer for me	7	7	27	37	22
PBR6 Ride-hailing offers privacy from strangers while traveling	8	4	20	40	28
PBR7 Ride-hailing vehicles are clean	7	4	20	42	26
PBR8 With ride-hailing I can perform other tasks while traveling	8	4	18	40	30
ACU Attitude toward car use (rational/instrumental) ($\alpha = 0.919$)					
ACU1 Having a car means that one can travel in comfort	6	5	17	37	35
ACU2 With a private car one can get to places faster	6	4	18	40	32
ACU3 The car offers convenience and reliability	6	3	18	44	30
ACU4 Having a private car means that one has privacy from strangers when traveling	6	3	16	38	38
ACU5 The private car is safer	5	4	19	33	39
SCV Social-symbolic value of Car ownership/use ($\alpha = 0.873$)					
SCV1 A private car is a symbol of success in life	13	16	34	25	13
SCV2 A private car is a symbol of social status	9	12	33	33	14
SCV3 Cars are a symbol of modern life	7	8	34	34	18
PRC Perceived similarities between ride-hailing and (private) car use ($\alpha = 0.921$)					
PRC1 When I use ride-hailing, I feel I am as comfortable as traveling in a private car	7	11	22	41	18
PRC2 Using ride-hailing enables me to get to	8	10	22	39	22

(continued on next page)

Table 2 (continued)

Latent variables and their indicators/items	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree	
PRC3	places just as fast as having a private car	8	11	23	37	22
PRC4	Ride-hailing offers me the same level of privacy from strangers as having a private car	6	11	30	35	18
PRC5	Ride-hailing use is as safe as using a private car	7	10	24	39	20
ENV	Using ride-hailing is as convenient and reliable as using a private car					
ENV1	Attitude toward the environment ($\alpha = 0.927$) We need to control the rate at which raw materials are used to ensure that they last as long as possible	5	3	27	34	31
ENV2	It makes me sad to see the natural environment destroyed	5	2	20	33	39
ENV3	In my daily life, I try to find ways to conserve energy	5	3	29	35	28
ENV4	I would like to reduce the consumption of energy and other resources while travelling	5	3	26	34	32
ASP	Car Ownership and Use Aspirations ($\alpha = 0.897$)					
ASP1	I definitely want to own and use a car	6	2	19	34	39
ASP2	Having and using a car will be necessary in the future	6	3	19	38	35

Those who answered in the affirmative proceeded to complete the entire survey. We define young adults in this study as individuals aged between 18 and 35 years, following definitions contained in the national constitution of Ghana and the National Youth Policy. Thus, respondents also had to be between 18 and 35 years of age. Responses from individuals outside of this age range were excluded from the data before analysis.

As part of the survey, we elicited basic socio-demographic information about the participants and their ride-hailing use in the seven-day period preceding the day they filled in the survey. We present a descriptive summary of this information later in Table 1. Using a five-point Likert scale, we also formulated questionnaire items under each of the latent variables presented in the conceptual model, namely perceived benefits of ride-hailing; attitude towards car use (instrumental value), social-symbolic value of car use, attitude toward the

environment; perceived similarity between ride-hailing and car use; and car ownership and use aspirations. We clarified to our respondents that the items measuring car ownership and use aspirations, were intended to imply and captures their views in relation to ownership and use of the private car as the *primary mode* of travel in the near future. We present a descriptive summary of the responses to the questionnaire items under each of the latent variables later in Table 2.

3.2. Data collection

Previous research in the case study areas has shown that while car-based ride-hailing usage is wide-spread across the urban areas, the service tend to be popular on University campuses and around their immediate catchment localities (Acheampong et al., 2020; Ackaah et al., 2020). In view of this insight, coupled with our focus on young adults, we targeted participants in and around the major Universities in Accra and Kumasi.

We designed the survey to be self-completed online. Trained Field Assistants approached potential respondents, explained the research purpose and sought their consent to participate. Respondents who agreed to participate had to be at least 18 years of age and should have used a car-based ride-hailing service in the past. Respondents could fill in the survey using one of three ways. Firstly, the Field Assistants held a Tablet with which the respondents could self-complete the survey. Alternatively, they provided a QR-code that respondents could scan using their smartphones to access and fill in the questionnaire. As third option, respondents could ask for a link to the questionnaire to be sent via email for them to complete at their convenience. We encouraged those who received the survey link or scannable QR-Code to forward them to their colleagues as a way to potentially reach more respondents. We expected the survey to be completed in not more than 20 min. No participant received financial or in-kind reward, for completing the survey. Ultimately, 2,059 respondents filled-in the survey between February and August 2021. Of this, 91% indicated that they have used car-based ride-hailing, resulting in a total of 1,868 valid responses.

3.3. Analysis: Structural equation modelling

Given the latent variables involved in this study and the several hypothesized relationships, we adopted Structural Equation Modelling (SEM), a suitable statistical modelling approach. SEM combines linear regression and factor analysis of latent variables to provide a robust statistical method to examine a set of causal hypotheses that are based on theory or conceptual model (see Kline, 2016). After specifying the SEM based on the conceptual model (Fig. 1), we ascertain the extent to which the empirical data support the hypothesised relationships. In doing this, we used model identification indices, including the Chi-square statistic (χ^2); Normed Fit Index (NFI); Comparative Fit Index (CFI); Tucker–Lewis Index (TLI); Incremental fit index (IFI); and Root Mean Square Error of Approximation (RMSEA). NFI, CFI, TLI, and IFI values ≥ 0.90 indicate acceptable model fit, while RMSEA values of 0.01, 0.05, and 0.08 indicate excellent, good, and mediocre fit, respectively (see Kline, 2016). For this paper, we specified a SEM using the maximum likelihood estimation method in AMOS statistical software.

4. Results

4.1. Sample characteristics

Descriptive summary statistics of the socio-demographic characteristics of the survey respondents are presented in Table 1. About 75% of the respondents were recruited from Accra. Females and males constituted 44% and 56% of the total sample. The majority of the sample were aged between 18 and 23 (63%) and 24–29 (27%), with a large majority still enrolled in tertiary education (University). About 19% had obtained a driver’s licence while 8% were learning to drive and so had obtained a

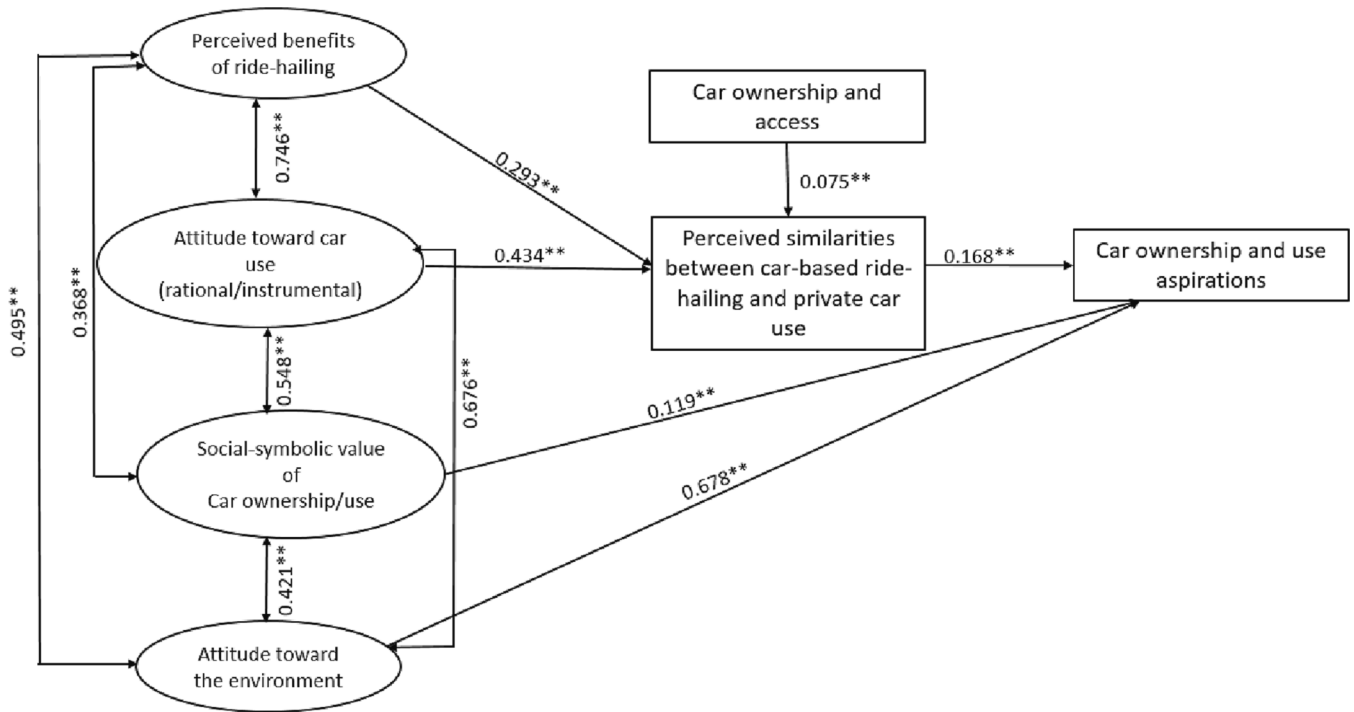


Fig. 2. A simplified path diagram of the SEM showing standardised co-efficient of only the factors that have statistically significant correlation and direct explanatory relationships. Model fit indices: $\chi^2 = 2751.768$, $df = 461$, $p < 0.001$; RMSEA = 0.052; NFI = 0.945; CFI = 0.953; IFI = 0.953; TLI = 0.947. ** P-value < 0.01.

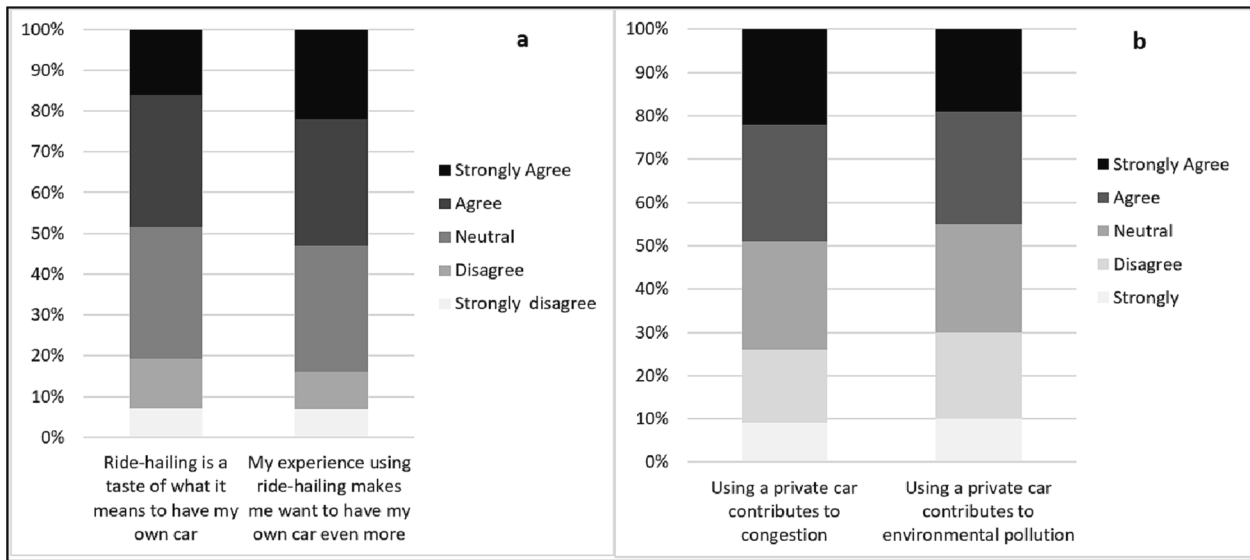


Fig. 3. Individuals' responses to items measuring their (a) attribution of ride-hailing use as influencing car ownership aspirations; and (b) opinions about the impact of car use.

provisional licence. Regarding car ownership, the results show that only 7% of the respondents owned a car, although another 30% of the sample indicated that while they do not own a car, they have access to at least one car in their household that they could use depending on availability.

The study participants also provided information about their car-based ride-hailing use in the seven-day period prior to completing the survey. Within this period, 35% and 25% indicated having used a car-based ride-hailing service at least once or between three and five times, respectively. On their self-reported ride-hailing use pattern, 39% of the respondents indicated that they do so 'a few times' in a month, 46% ride-hailed 'occasionally' in a month while the remaining 15% indicated being frequent users as reflected in their response that 'ride-

hailing is the main way I move around'. Moreover, the purpose of the respondents' most recent trips using ride-hailing was work or school-related commute (55%), 'Special occasion' trips (31%), such as attending social functions, church and funeral, and other more diverse trip purposes (14%). Additional information on the respondents' car-based ride-hailing trip characteristics, including vehicle occupancy and modes substituted are provided in Table 1.

4.2. Descriptive overview of latent variables

In Table 2, we show the internal consistency (i.e. how closely related the set of indicators or items are as a group) by computing Cronbach's

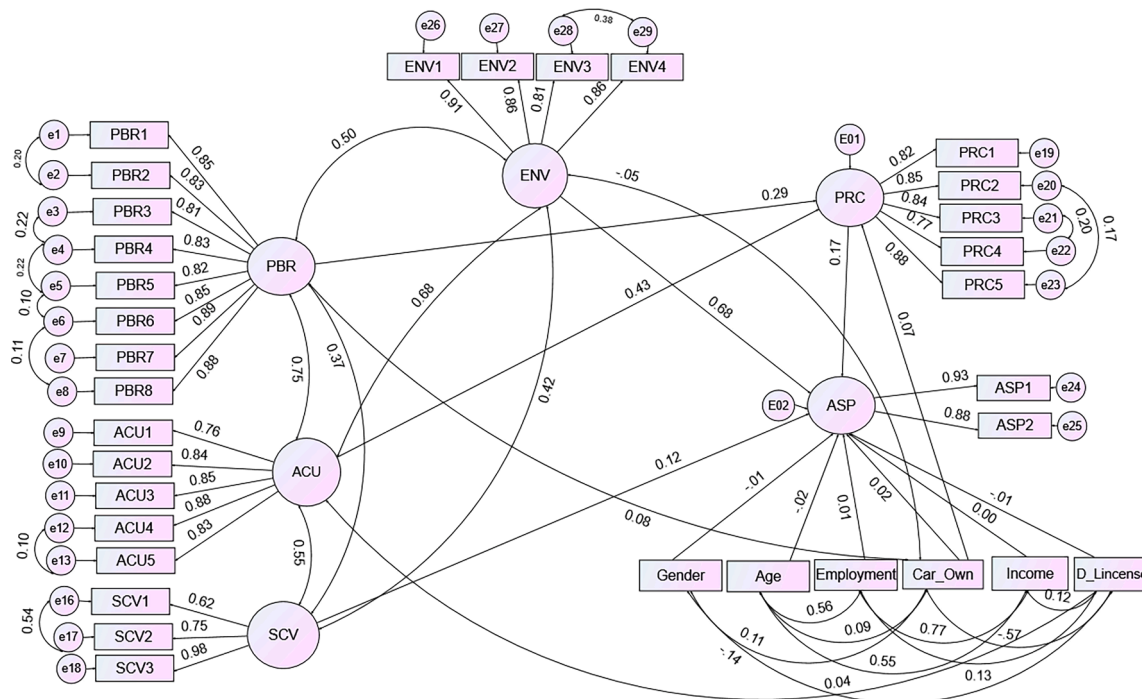


Fig A1. Full path diagram of SEM of the determinants of car ownership aspirations. Model fit indices: $\chi^2 = 2751.768$, $df = 461$, $p < 0.001$; RMSEA = 0.052; NFI = 0.945; CFI = 0.953; IFI = 0.953; TLI = 0.947.

alpha (α) and present a descriptive statistical summary of the participants’ responses to each of the questionnaire items. The result show that all the items yield relatively high internal consistency for their respective groups/sub-scales with Cronbach’s Alpha (α) ranging between 0.873 and 0.954.

Regarding the *perception of car-based ride-hailing benefits*, the survey results show that a significant percentage of our respondents agreed or strongly agreed with all the indicator items. This reflects the general belief that this form of mobility affords a number of instrumental benefits, including making travel flexible (68%), convenient (65%) and offering privacy from strangers while traveling (68%). The respondents also acknowledged the time use benefits associated with being a passenger as opposed to driving, with 70% agreeing and strongly agreeing with the item ‘with ride-hailing I can perform other tasks while travelling’.

More than 70% of the respondents agreed to all the indicator items measuring *attitude towards car use*, suggesting that overall the study participants held favourable attitude towards car use, recognising all the associated instrumental and convenience-based value or benefits. Moreover, the study participants also recognised the *social-symbolic value of the car*. More than half (52%) agreed that cars are a symbol of modern life. About 47% of the respondents also agreed or strongly agreed that a private car is a symbol of social status. Regarding the item measuring the extent to which the respondents believed that a private car is a symbol of success in life, the percentage of respondents agreeing or strongly agreeing was lower (38%), with 34% of the respondent indicating a neutral response, which could suggest ambivalence.

Furthermore, across all the items we formulated to elicit our participants’ *perception of the similarity between car-based ride-hailing and a private car*, more than half either agreed or strongly agreed. About 61% of the respondents agreed that using ride-hailing enables them to get to places just as fast as having a private car. Travel comfort (59%), safety (53%), privacy from strangers (59%) and convenience and reliability (59%) were all recognised by our respondents as instrumental benefits that both the private car and ride-hailing, as a form of car-based transport, offered.

Finally, most respondents held a positive *attitude toward the*

environment and indicated an awareness of the environmental costs of human actions including everyday mobility choices. Regarding the outcome variable, which is *car ownership and use aspirations*, 72% of the respondents either agreed or strongly agreed to the two indicator items measuring aspirations, suggesting that most of them would ‘definitely want to own and use a car’ and believe that ‘having and using a car will be necessary in the future’.

4.3. SEM specification and results

A path diagram summarising the results of the SEM is presented in Fig. 2. The full path diagram and table summaries of SEM estimates are presented in Appendix A (Fig. 1A and Table 1A, respectively).

The measurement model of the SEM, which is essentially a Confirmatory Factor Analysis (CFA), shows the correlations between the latent variables in the model. The CFA shows a strong positive relationship between individuals’ attitudes toward car use and the perceived benefits of car-based ride-hailing ($r = 0.746$), suggesting the instrumental benefits of both forms of car-based transport as perceived by the respondents are highly correlated. As expected, attitude toward car use, which in this study reflects the car’s instrumental value and the social-symbolic value, which reflect the cultural meaning of car use, is also strongly positively correlated ($r = 0.548$). Moreover, the results show moderate positive correlations between attitude toward the environment and perceived benefits of car-based ride-Hailing ($r = 0.495$) and attitude toward the environment, and attitude toward car use ($r = 0.676$) and symbolic meaning of car ownership and use ($r = 0.421$). Together, these findings suggest that our respondents hold contradictory attitudes of being pro-environment while at the same time favouring car-based transport (private car and car-based ride-hailing). Additional pairs of statistically significant associations between variables are provided in Table 1A, Appendix A.

The structural model shows estimates of direct effect relationships, having accounted for the correlations and covariations between variables. As shown in Fig. 2, attitude toward car use and perceived benefits of car-based ride-hailing have positive explanatory effects on similarities between ride-hailing and (private) car use as perceived by our study

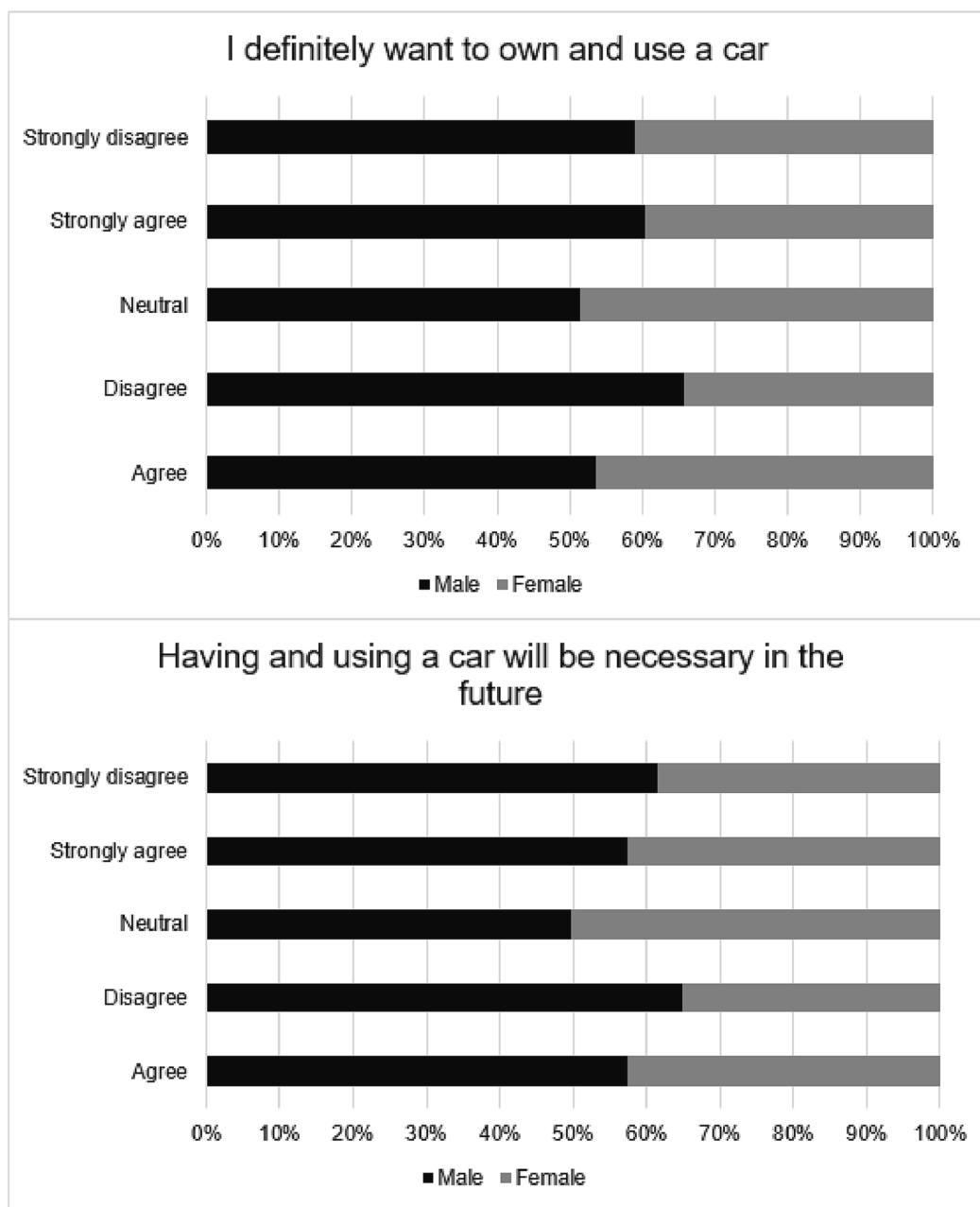


Fig. 2A. Summary of responses to items measuring car ownership and use aspirations by male and female respondents of the survey.

respondents ($b = 0.434$, $b = 0.293$, respectively; $R^2 = 0.47$). Moreover, there is a small but statistically significant positive association between car ownership and access and perceived similarities between ride-hailing and car use ($b = 0.075$). This means that individuals who own a car or have access to at least one car within their household are more likely to identify strong similarities between car-based ride-hailing and the private car. Taken together, these findings imply that our respondents' overall positive attitudes towards car ownership and use and appreciation of the instrumental benefits of ride-hailing explain their belief that these two forms of car-based transport are indeed similar.

Furthermore, controlling for other variables, the SEM results show that perceived similarities between car-based ride-hailing and (private) car use and the social-symbolic value of car ownership and use all have a positive explanatory effect on individuals' car ownership and use aspirations ($b = 0.168$, and $b = 0.119$, respectively). We probed further the possible relationship between car-based ride-hailing use and car ownership and use aspirations with the two additional questionnaire

items summarised in Fig. 3a. The results show that nearly half of our respondents (48%) agreed that car-based ride-hailing actually offered a 'taste of what it means to have my own car' while more than half (53%) indicated that their experience with car-based ride-hailing was a primary reason behind their car ownership and use aspirations.

A somewhat contradictory finding is that despite our respondents generally holding pro-environmental attitudes, they also aspired to own and use a car, with the former having a relatively larger statistically significant effect on the latter ($b = 0.678$). Indeed, the study participants expressed agreement with the items 'using a private car contributes to congestion' (49%) and 'using a private car contributes to environmental pollution' (45%)—Fig. 3b. Thus, while there is an awareness of the negative environmental impacts of car ownership and use, as the results of the SEM show, most of the respondents aspire to own and use the car to meet their travel needs.

The socio-demographic variables included in the model (i.e. age, gender, employment and income) did not have statistically significant

Table A1
Correlations, covariance and regression weights of relationships among variables in SEM.

Direct Effects			β	b	S.E.	C.R.	P-Value
Perceived Similarities Between Ride-Hailing And (Private) Car Use (PRC)	<-	Perceived Benefits Of Ride-Hailing (PBR)	0.284	0.293	0.031	9.251	***
Perceived Similarities Between Ride-Hailing And (Private) Car Use(PRC)	<-	Attitude Toward Car Use (ACU)	0.472	0.434	0.035	13.328	***
Perceived Similarities Between Ride-Hailing And (Private) Car Use(PRC)	<-	Car Ownership & Access	0.15	0.075	0.038	3.974	***
Car Ownership and Use Aspirations (ASP)	<-	Perceived Similarities Between Ride-Hailing And (Private) Car Use(PRC)	0.164	0.168	0.019	8.599	***
Car Ownership and Use Aspirations (ASP)	<-	Social-Symbolic Value Of Car Ownership/Use (SCV)	0.109	0.119	0.017	6.327	***
Car Ownership and Use Aspirations (ASP)	<-	Employment	0.028	0.013	0.056	0.498	0.619
Car Ownership and Use Aspirations (ASP)	<-	Attitude Toward Environment (ENV)	0.719	0.678	0.025	28.929	***
Car Ownership and Use Aspirations (ASP)	<-	Age	-0.022	-0.017	0.025	-0.852	0.394
Car Ownership and Use Aspirations (ASP)	<-	Car Ownership & Access	0.04	0.02	0.039	1.021	0.307
Car Ownership and Use Aspirations (ASP)	<-	Income	0.003	0.002	0.032	0.089	0.929
Car Ownership and Use Aspirations (ASP)	<-	Drivers Licensure	-0.029	-0.013	0.043	-0.661	0.509
Car Ownership and Use Aspirations (ASP)	<-	Gender (Female)	-0.018	-0.009	0.031	-0.596	0.551
			Cov	Corr	S.E.	C.R.	P-Value
<i>Correlations and covariance</i>							
Perceived Benefits Of Ride-Hailing (PBR)	<->	Social-Symbolic Value Of Car Ownership/Use (SCV)	0.393	0.368	0.028	14.177	***
Attitude Toward Environment (ENV)	<->	Perceived Benefits Of Ride-Hailing (PBR)	0.456	0.495	0.026	17.297	***
Attitude Toward Environment (ENV)	<->	Social-Symbolic Value Of Car Ownership/Use (SCV)	0.404	0.421	0.026	15.633	***
Attitude Toward Car Use (ACU)	<->	Social-Symbolic Value Of Car Ownership/Use (SCV)	0.524	0.548	0.028	19.055	***
Perceived Benefits Of Ride-Hailing (PBR)	<->	Attitude Toward Car Use (ACU)	0.685	0.746	0.031	22.425	***
Attitude Toward Environment (ENV)	<->	Attitude Toward Car Use (ACU)	0.556	0.676	0.027	20.896	***
Car Ownership & Access	<->	Attitude Toward Environment (ENV)	-0.023	-0.051	0.007	-3.217	0.001
Car Ownership & Access	<->	Perceived Benefits Of Ride-Hailing (PBR)	0.039	0.08	0.007	5.343	***
Gender (Female)	<->	Car Ownership & Access	0.027	0.113	0.006	4.934	***
Gender (Female)	<->	Drivers Licensure	-0.03	-0.139	0.005	-6.042	***
Age	<->	Income	0.309	0.554	0.015	21.218	***
Employment	<->	Age	0.183	0.56	0.009	21.438	***
Employment	<->	Drivers Licensure	0.026	0.134	0.003	8.065	***
Age	<->	Car Ownership & Access	0.034	0.092	0.006	5.747	***
Drivers Licensure	<->	Attitude Toward Car Use (ACU)	0.016	0.039	0.005	3.099	0.002
Drivers Licensure	<->	Income	0.04	0.123	0.005	7.392	***
Drivers Licensure	<->	Car Ownership & Access	-0.123	-0.574	0.006	-22.008	***
Employment	<->	Income	0.255	0.77	0.01	26.55	***

Notes: β = Unstandardized regression estimates, b = standardized regression estimates; cov = covariance, corr = correlation; *** P-value < 0.01. Correlation among error terms (e) depicted in the path diagram in Fig. A1 are all statistically significant, but not included in this table. Model fit indices: $\chi^2 = 2751.768$, $df = 461$, $p < 0.001$; RMSEA = 0.052; NFI = 0.945; CFI = 0.953; IFI = 0.953; TLI = 0.947.

relationships with the other variables. A cross-tabulation analysis showed that, overall, responses to the individual questions of the survey did not differ significantly by these socio-demographics characteristics of the respondents. In the case of responses to the items measuring car ownership and use aspirations (i.e. the outcome variable), we found some differences between males and females as shown in Fig. 2A, Appendix A. For examples males constituted 60% and 62% of the total sample of respondents who strongly agreed with the statements 'I definitely want to own and use a car' and 'Having and using a car will be necessary in the future', respectively. Controlling for the other variables, these differences, however, did not turn out to be statistically significant in the SEM.

Overall, the model explains 68% of the variation in individuals' car ownership and use aspirations ($R^2 = 0.68$) while all the identification indices show a good fit between the empirical data and the theoretical model we advanced earlier in the conceptual framework.

5. Discussion

We set out in this paper to examine car ownership and use aspirations among young adults in the context of the growing presence and use of car-based ride-hailing services in urban areas. Our central argument is that individuals can now access car-based transport in ways that were not possible prior to the advent of ICT-mediated, car-based ride-hailing services. In view of this, we sought to examine the extent to which the new possibilities, created by app-based ride-hailing services for use of

car-based transport to meet everyday mobility needs, influence aspirations for car ownership and use. To this end, we have mobilised a new conceptual model that accounts for the possible influences of individuals' perceived similarities between car-based ride-hailing and private car use in explaining car ownership and use aspirations. The framework also accounts for the influence of perceived benefits of car-based ride-hailing, instrumental and social-symbolic aspects of car use, attitude toward the environment and individuals' socio-demographic characteristics. We tested our conceptual model empirically by surveying young adults in Ghana's major cities who have used a car-based ride-hailing service and specifying a SEM to estimate covariance and direct effect relationships among the study variables.

Results of the SEM showed that overall, our participants held positive attitudes toward the instrumental value of car ownership and use, and perceived car-based ride-hailing to be also beneficial in instrumental aspects such as providing flexible, convenient and fast travel option. The analysis showed a strong positive correlation between these variables. We also found individuals' attitudes toward ownership and car use in instrumental and social-symbolic aspects were strongly positively correlated, implying that both the cultural meaning/status value (Gartman, 2004) and practical convenience-based aspects (Gatersleben, 2011) of the car were acknowledged and underpinned individuals' attitudes. The correlation analysis between latent variables also revealed that our respondents held contradictory attitudes towards the environment and car-based transport (i.e. private car and ride-hailing), as evidenced by the positive correlation among these variables. Whereas most

of our participants' responses reflected pro-environmental attitudes, they also favoured car use in both instrumental and social-symbolic aspects and perceived ride-hailing to be overall beneficial as a form of car-based transport.

Controlling for covariations among latent variables, the SEM also shows direct explanatory effect of individuals' attitude towards car use (instrumental aspects) and perceived benefits of car-based ride-hailing on perceived similarities between the two car-based transport modes (i.e. private car and ride-hailing). We also found a statistically significant positive association between owning a car and having access to a car at the household level and perceived similarities between car-based ride-hailing and car use. In our survey, the items that constituted the two latent explanatory variables (i.e. perceived benefits of ride-hailing and attitude toward car ownership and use) reflected rational and instrumental aspects that people tend to associate with car-based transport, such as convenience, flexibility, privacy and fast travel (see e.g. Gateorleben, 2011, Hiscock et al., 2002). Individuals' perceived similarities between car-based ride-hailing and car ownership use, in turn, had a positive explanatory effect on car ownership and use aspirations. Thus, consistent with our initial assumptions, individuals did not only acknowledge that both the private car and ride-hailing have similarities in instrumental aspects, but the perceived similarities also explained their aspirations for car ownership and use. We argue, based on the above findings that, for most of the young adults in our sample who do not have a car currently, ride-hailing could be fulfilling an immediate preference for car-based transport that would ultimately transition into car ownership and use when they are able to afford to do so in later life. Indeed, a large proportion of our respondents acknowledged that their use of car-based ride-hailing offered a taste of what it meant for them to have their own car and that their experience with ride-hailing was a primary reason behind their car ownership and use aspirations.

Moreover, controlling for other variables, results of the SEM showed that the social-symbolic value of car ownership and use, which reflects the cultural meaning, and status value of the car also had a direct positive association with car ownership and use aspirations among our study participants. This finding is consistent with previous studies on individuals' ambition for car ownership in different socio-cultural contexts (Hopkins et al., 2021; Meena et al., 2021; Verma et al., 2017; Belgiawan et al., 2016; Zhu et al., 2012). Zhu et al., (2012) found that among Chinese university students, the social-symbolic or status value of the car influenced their aspiration for car ownership more so than the instrumental aspects. Similarly, status-seeking and image-consciousness were found to be influential in future car buying aspirations among young individuals in India (Meena et al., 2021). In their study of car ownership motivations among university students in Bandung, Indonesia, Belgiawan et al., (2016) found symbolic/ affective and associations of prestige as influential factors.

Furthermore, we found that not only did attitude towards the environment correlates positively with attitude towards car ownership and use (symbolic and instrumental), but it also had a large positive association with individuals' car ownership and use aspirations. This finding resonates with what has been termed as cognitive dissonance in travel behaviour studies, whereby there is an attitude-behaviour gap (see e.g. De Vos and Singleton, 2020; Acheampong et al., 2020; Schrems and Upham, 2020; Kroesen et al., 2017; Belgiawan et al., 2016). As these studies have reported, dissonance can lead to environmental convictions not always matching expectations that individuals would opt for environmentally-friendly mobility options. As is the case in this study, we found that there is a dissonance or disjuncture between individuals holding pro-environmental attitudes and recognising the negative environmental impacts of car ownership and use, but yet expressing a favourable attitude towards car-based transport (private car and car-based ride-hailing) and wanting to own and use a car in the near future.

It is worth mentioning that a number of previous studies have provided evidence to the contrary that car ownership and use are declining among younger adults and that this demographic may have less

favourable attitudes towards private cars (see e.g. Zhou and Wang, 2019; Chatterjee et al., 2018; Delbosc and Currie, 2013). However, the evidence from previous research, similar to what we present in this paper, suggests that there is a growing motorization and increasing demand for private car ownership in developing countries and emerging economies in the global south (Yang et al., 2017; Stead and Pojani, 2016; Cervero, 2013; Kutzbach, 2009; Luke, 2018). Furthermore, based on our findings, we argue that in the context of the profound changes triggered by new transport technologies and mobility services, new behaviours are likely to emerge, particularly around car ownership and use that warrant further global research.

6. Conclusion, limitations and further research

The findings of this study lead us to reflect on two contrasting conclusions. On the one hand, if individuals perceive many close similarities between car-based ride-hailing and the private car, especially in terms of the rational instrumental value both provide, then one could argue that the former could replace the latter, and that car-based ride-hailing could reduce car ownership and use. On the other hand, as the findings of this study have clearly shown, not only do individuals perceive close similarities between these two forms of car-based transport, but their car ownership and use aspirations are strongly underpinned by their experience using car-based ride-hailing. Consequently, the increasing use of car-based ride-hailing could be seen as not only introducing young adults to car use, but also shaping mobility choices and habits that could lead them to owning and using a car in the near future. We argue, therefore that car-based ride-hailing use is a step closer and a means to fulfilling personal car ownership and use aspirations in the near future.

An immediate implication of the aforementioned is the challenge it presents for policy aimed at reducing car ownership and use, as well as the associated negative impact on the environment and public health, especially in the context of developing countries where motorization levels are fast rising. In order to create sustainable urban transport and mobility futures, it is crucial that policy-makers understand and anticipate the broader travel behaviour impact of ICT-mediated car-based mobility services such as ride-hailing. The use of car-based ride-hailing services to meet every day urban mobility needs is expected to grow in the coming years. This, however, does not mean that the possible effects on future car ownership and use are inevitable. Instead, we argue that cities could minimize the likelihood of entrenching car-dependence as a long term impact of car-based ride-hailing by investing in public transport as an attractive alternative mode of transport. Indeed, the poor public transport system in urban areas in Ghana is one of the primary reasons behind the growing presence of digital platform mobility providers and increasing utilisation of the available ride-hailing services (Boateng et al., 2022; Acheampong et al., 2020). Leveraging ICT to improve level of service of public transport, including the ubiquitous paratransit system is one way that cities could improve the efficiency and attractiveness of their public transport systems as alternative to car-based alternatives. There is also the need for urban development policy and planning to promote and support sustainable alternatives such as bicycling and walking to reduce overall reliance on car-based transport.

We recognise that while providing many useful insights, the current study has limitations. We consider this study as an exploratory one, possibly among the first of its kind to explore the question of how car-based ride-hailing may influence car ownership and use aspirations. Thus, further research would be required to deepen our understanding of the possible influences that new and emerging mobility services such as app-based ride-hailing could have on travel behaviours. To this end, it would be useful to accrue further empirical insights from different socio-cultural and geographical contexts. The conceptual model advanced and tested in this paper could inform such future inquiries. Moreover, our initial cross-sectional, survey-based study could provide the foundation for longitudinal design, taking a life-course perspective to establish individuals' changing travel behaviours in the context of ubiquitous ICT-

mediated car-based mobility services such as ride-hailing.

Finally, this study focused on the car-based ride-hailing and its possible associations with car ownership and use aspirations. There are, however, other forms of ride-hailing, such as motorcycle-based ride-hailing that was not covered in this study. One reason is that in the Ghana context, motorcycles are generally considered illegal forms of public transport. That said, we recognize that motorcycles and motorcycle-based ride-hailing are legitimate and viable alternatives of transport in other contexts. Thus, future research could also explore the possible links between motorcycle-ride-hailing and aspirations for car-based forms of transport.

CRediT authorship contribution statement

Ransford A. Acheampong: Conceptualization, Methodology, Investigation, Formal analysis, Writing – original draft, Writing – review & editing, Visualization. **Ernest Agyemang:** Investigation, Writing – review & editing. **Augustine Yaw Asuah:** Investigation, Writing – review & editing.

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.

Appendix A

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