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CONNECTING URBAN MOBILITY AND GENDER ROLES

A case study from Hochiminh City Vietnam

Thị Ngọc Tú LÊ

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2022 FFJ / Michelin Foundation Fellow

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Connecting urban mobility and gender roles: A case study from Hochiminh City Vietnam

Thị Ngọc Tú LÊ

Abstract

Transport infrastructure and services are the means to improve the well-being of all groups of the population, including women, men, children, the elderly, and people with disabilities. However, they are often incorrectly considered 'gender-neutral'. In fact, mobility is socially determined by gender roles related to reproduction, production, and community. This research investigates the cohesive relationship of urban transportation including Mobility, Gender, and Care by studying the case of HoChiMinh city (HCMC). The differences between women's and men's participation in transportation are identified and connected to the social-gender role activities. The findings show a clear relationship between urban mobility and gender roles. There is clear evidence of women's trade-off between traveling less than men and carrying more unpaid work in the family, which is more pronounced for married women who live with family. Differences in women's traffic experiences with men's reveals the disadvantage of women in traffic. The findings of this research will assist the HCMC transport sector and project executive agencies in designing gender-inclusive projects. The dissemination of this research will draw attention to the gender dimension of transport and encourage gender mainstreaming across the transport sector to promote and support gender equality and women's empowerment.

Keywords

Urban Mobility, Gender, Gender Inclusion, Transportation, Hochiminh City, Vietnam

JEL: J160, J600, O180, R410, R420

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Hoa Sen University

2022 FFJ/Michelin Foundation Fellows, EHESS

1. Introduction

Transport infrastructure and services play a crucial role in enhancing the well-being of individuals by providing access to economic and social opportunities. As such, these services must be designed to cater to the needs of all segments of the population in an equitable, affordable, and responsive manner. This includes women, men, children, the elderly, and people with disabilities. However, there is often a misconception that transport infrastructure and services are "gender-neutral". This erroneous assumption implies that public transportation provides equal benefits to both men and women, without any significant differences in travel patterns, modes of transport access, and utilization of transport infrastructure and services (ADB, 2013).

Mobility is socially determined by gender roles related to reproduction, production, and community. The relative economic and social status, as well as livelihoods of women and men also influence the different needs and usages of transport services. People use various modes of transport for different purposes and in different manners. Scholars have discussed these differences in the literature, but there are still many gaps that need to be filled.

This study will investigate the cohesive relationship between urban mobility, gender, and care. We will examine the intersection and interaction of these terms by introducing the case-study of HCMC. That means the HCMC urban mobility will be studied under the gender focus. The following specific objectives will be: (1) to identify the difference in transportation participation between men and women; (2) To connect these differences in terms of gender function in mobility and caring activities; and 3) To suggest better planning for gender-focus investment of public transportation system. To achieve the stated objectives, this research will examine gender disparities in traffic time and its connection to unpaid work. It will investigate whether there are differences in total traffic time between genders, if these variations are activity-dependent, and if there's an association with gender roles.

The findings show a clear relationship between urban mobility and gender roles. Women tend to travel less than men and have to take on more unpaid family work, especially among married women who live with their families. Differences in women's traffic experiences with men's reveals the disadvantage of women in traffic.

The outline of the paper is as follows: Section 2 provides a review of the literature. Section 3 presents the data collection, descriptive statistics, and the empirical model. In Section 4, we present the estimation results and discussions. Finally, Section 5 concludes by summarizing the main findings, providing recommendations for the HCMC transport sector in executing agencies to design gender-inclusive projects, and discussing some interesting points for future research.

2. Literature review and research gaps

2.1 Review of studies on Mobility and Gender, Mobility and Care

Research on the relationship between daily mobility and gender began examined by feminist transportation geographers and urban planners in the 1970s (Law, 1999). They made against conventional planning assumptions where gender is an irrelevant variable in calculating future infrastructure needs and adjusted planning practices to suit men's commuting needs with relatively simple mobility patterns (from home to work and back) that don't account for the reproductive work that women associate with their activities as part of the workforce.

American literature in the 1980s divided the worldview into two spheres, including the public world and the home, and expected women to belong to the latter (Lopata, 1980). Evidence from the Uppsala Household Travel Survey shows that a woman's full-time employment reduces their participation in some non-work activities but has little impact on that of her husband (Hanson & Hanson, 1981). Along with related factors, job tenure, work hours, and wages, sex differences in household 'roles' is an important factor influencing women to work 'closer to home' (Fanning Madden, 1981). Other researchers who are interested in the relationship between speculations on housing, urban design, and human work, had raised the question "What would a non-sexist city be like?" (Hayden, 1985). In general, men have longer commuting distances than women. Couples tend to choose a place of residence closed to the wife's place of work to facilitate the wife's caring activities (Tkocz & Kristensen, 1994). These studies indicated the fact that women's commuting patterns are more influenced by the city's structure than those of men, and are more vulnerable to changes in the industrial structure of the cities.

Later, scholars from some related fields also considered gender issues, such as urban planning, transportation, sociology, geography, and architecture (De Madariaga & Roberts, 2016; Loukaitou-Sideris

et al., 2009). They analyzed differences in the travel behavior of men and women. Such differences are associated with the daily activities of men and women; as well as related to their social-gender roles, typical life courses, and the social organization of production and reproduction in general. (Mandel, 2004) discussed the importance of urban mobility in the creation of profitable livelihood strategies for women in Porto Novo, Benin. In Delhi India, poor women often choose slower modes of transport for a cheap price, along with their time-poverty. They have to accept jobs near their homes with low pay. Their limited mobility and constrained accessibility to the transport system are factors that create barriers to accessing the labor market for women (Anand & Tiwari, 2006). Also in India, in another study on the Delhi Metro, the authors argue the separation of compartments for women, creating confusion in the view of women's equal rights in traffic as well as limiting their ability to negotiate for their rights. The authors suggested that these are emerging concerns that need to be addressed more proactively (Agrawal & Sharma, 2015). Addressing complex social issues, such as sustainability, will require an improved understanding of the relationship between gender and mobility. Reviewing large literature on gender and mobility (Hanson, 2010) shows two disparate strands of thinking that have remained disconnected from each other; One strand has investigated how mobility shapes gender, while the other has examined how gender shapes mobility. In this study, we connect urban mobility and social gender-roles, in which we investigate the correlation between the two.

Recent efforts to shift the focus of transport planners from commuting trips related to 'Mobility of care' (Inés Sánchez de Madariaga, 2013). This approach is likely to provide the practical and operational foundations needed to sustain a new approach to data collection, and thus policy definition and implementation, to better mainstream gender considerations into planning and transportation management.

The first wave of gender mainstreaming was legislated in the European Union in 1999. Throughout the decade, many impactful interventions have taken place within the EU and over the world, but there is still much to do in terms of women's empowerment. (De Madariaga & Roberts, 2016) focus on the theoretical issues and questions that surround the concept of gender mainstreaming as they relate to urban space and the planning of cities and regions in their second wave of gender mainstreaming related to the women's movement and critiques of planning, architecture, transport planning, and public space. In the book by (De Madariaga & Roberts, 2016), the authors discuss the persistence of gender inequalities in accessibility to urban space and services. The authors emphasize the importance of time and space in the urban experience, the resistance to change in social institutions and structures, and the importance of networks. Continuing this research approach, this study will investigate two aspects of mobility, including Mobility and Gender, Mobility and Care.

A new mobility-transport system that includes gender-sensitive transport investment planning can play a role as a means of unlocking women's economic potential.

Investment in transport should focus on facilitating the mobility of people for different purposes and needs and in different modes, in which women and men, children and elders experience differently, in order to make the gender dimensions of transport more evident. Well-designed transport infrastructure can empower women economically and serve as the first step for women to access job opportunities (Jobes et al., 2017). In the North East of England, where private transport is a key factor in participating in the labor market, there are links between women, transport, and labor participation, and the development of sustainable transport systems would support determining women's economic inclusion (Dobbs, 2005). There is also a potential to increase social mobility when combined with skills training, capacity building, and changes in social norms (H. Brejnholt, K. Ansbæk, 2016). Urban mobility also has strong impact on how women's access to education, jobs, or simply their enjoyment of city life (The World Bank, 2022). While (Vella-Brodrick & Stanley, 2013) studied a case from Melbourne, Australia, the authors argued that the benefits of transport mobility could extend to psychosocial factors leading to well-being.

On the contrary, restrictions on daily mobility would separate women from socio-economic development, exacerbate inequality, and reinforce negative social norms. Evidence shows that ignoring gender differences in transport planning and operation is a missed opportunity for women's economic growth and empowerment (Jobes et al., 2017). In western and southern Africa, (Porter, 2011) found three key impacts of relative immobility and poor service access on women and girls, including access to education, access to markets, and access to health services. Girls living in less accessible villages have a higher likelihood of school drop due to hazardous journeys, and transport costs, and also their work at home puts pressure on them to leave the school. For women, a long walk journey to a health care center is a key factor preventing them to access necessary health care services. Similarly, unavailability or high cost of transport creates a barrier for women to access markets. In another context, in Saudi Arabia countries, before 2018, women were not allowed to drive, they have been dependent on male drivers or private transportation to go to work, (Williams et al., 2019) show that when the cost of transport increases, the female labor force participation decreases. While Indian female labor force participation is very low, especially among married women (Klasen et al., 2020), and women are much less likely than men to work in nonfarm sectors, and (Lei et al., 2019) found the improved transportation infrastructure a stronger positive effect on women's nonfarm employment. Geographers over the world have examined and confirmed the assumption that locally constricted prevents women from taking up economic opportunities. However, the investigation into the role of the broader economic, physical, and social

context in women's mobility and accessibility constraints is mainly concerned even in North America and Western Europe countries (Akyelken, 2017).

Asian Development Bank recommended that a well-designed transport infrastructure can engage women in more quality jobs in the transport sector, such as taking on roles as bus drivers, ticket collectors, and taxi drivers (ADB, 2011). Transport is one sector that has traditionally been regarded as ‘no place for women’. This may still be the case today in many countries (Turnbull, 2013). Even in some developed countries in Europe, the presence of women in the public transportation sector is relatively low (Semerci & Ergenali, 2016). The public transportation sector is one of the important sectors, which is often controlled by the local government, therefore as a role of employers’ position, they need to take this issue seriously to create a gender-inclusive working environment.

Transport investments that incorporate gender considerations in their design can yield significant benefits for women, as well as children, the elderly, and people with disabilities. These benefits include increased access to employment opportunities, markets, education, and health services, as well as a reduction in time poverty. Recognizing the opportunity costs associated with a gender-neutral approach is crucial in avoiding past mistakes and fostering commitment and action toward improving transport planning and management.

2.2 Ho Chi Minh City- Urban Mobility

Viet Nam has been among the world's fastest-growing economies. Ho Chi Minh City, the country's largest city and economic hub, is projected to experience a population growth rate of 2.1% per annum. With the economy expected to continue its growth trajectory in the medium term, household incomes are likely to increase, enabling more families to afford cars. However, if current trends persist and are not mitigated by improved transport infrastructure and public transport systems, Ho Chi Minh City may face challenges similar to those encountered by other large Asian cities such as Bangkok, Beijing, Manila, and Jakarta, including congestion, road safety issues, and air pollution (ADB, 2006). To address these challenges, the Government of Viet Nam has developed a strategy for Ho Chi Minh City that focuses on the development of public transport and road infrastructure to enhance urban living and the urban environment. The HCMC Government aims to increase the share of public transport in daily motorized trips to 25-30% by 2030. However, urban transport service schedules are not designed to accommodate the needs of women who often combine multiple trips for various tasks to different destinations.

Since its establishment in 1698, Ho Chi Minh City has been a water-based city, with canals, rivers, and their subsystems serving as the primary means of transportation and commerce. However, rapid urbanization and modernization have resulted in the deterioration of this multi-layered cultural heritage

(Vu, 2006). Urban flooding has emerged as a critical issue in Ho Chi Minh City, with the potential to cause significant loss of life, property, infrastructure, and livelihoods. In light of the escalating impacts of climate change and rapid urbanization, it is essential to enhance the resilience of road networks against disruptions.

In these difficult conditions, traveling by personal means of transport and controlling them for women become unsafe, especially when they often travel with children or grocery items after working time. In HCMC, women face psychological as well as physical pressure much higher than men in using transportation means due to many reasons, and consequently, this can cause road accidents. While men's crashes might be in majority caused by drunk driving or careless riding, women's accidents are more often due to being hit by other vehicles or by themselves (personal data, not published yet). Robbery and sexual abuse are also other issues for women when participating in urban transportation. They are often the target of many road predators who can take advantage of the women's physical weakness to steal their bags or attack them, causing injuries or accidents.

The above facts, together with the inadequate design of public transport infrastructure, will constrain women's access to urban public transport and limit its positive distributional impacts.

The HCM urban mobility is studied in this research focusing on the gender lens. The research will show evidence of the different transport needs of men and women, their different travel behavior, and their ability to access and afford public transport. Therefore, will highlight the link of a new transport system to promote women's economic empowerment.

The purpose of this research is to inform the HCM city, the department of urban transportation, about the differences in mobility and gender, as well as mobility and care. The findings of this research will assist the HCM transport sector and project executive agencies in designing gender-inclusive projects. The dissemination of this research will draw attention to the gender dimension of transport and encourage gender mainstreaming across the transport sector to promote and support gender equality and women's empowerment.

This research will entry points for integrating gender into transport policy dialogue and promote the country's transportation sector strategy as a means to address gender issues. Encourage the country's transportation policy and planning procedures to explicitly take gender into account. Align the proposed project to promote equal economic opportunities for both women and men, expecting to unlock barriers to women's economic empowerment.

3. Data and methodology

This research is designed to directly address gender differences and concerns in traffic and its relation to unpaid work. This study aims to answer three main research questions:

- 1) Is there a difference in total traffic time between women and men?
- 2) Are there differences in traffic times between women and men in different activities?
- 3) Is there a correlation between traffic time and gender roles in the family?

The following specific hypotheses will be conducted to answer the above questions:

H1: Women spend less in total traffic time than men do.

H2: Women spend less time in traffic for commuting activities than men do.

H3: Women spend more time in traffic for shopping and escorting activities than men do.

H4: Women spend more time doing unpaid work than men do.

H5: Women trade traveling time outside for doing unpaid work inside.

This study will also consider other approaches to identify subjective experiences in daily transportation, preferable utilities in transport, and experiences related to physical and mental health related to traffic. Research steps include the questionnaire design, data collection, data analysis, and discussing different perspectives to address women's and men's differences, and their concerns in the access, usage, and benefits of transport infrastructure and services. The following sections will describe our data sources and estimation approach in more detail.

3.1 Survey

In this study, the concept of mobility of care (Madariaga & Zucchini, 2019) is referenced to design the data collection questionnaire, along with the real context in HCMC, the transportation activities are divided into numerous small categories such as work-related, learning & training, escorting and shopping, entertaining, networking, health-related, and community-related issues, etc. Subdividing activities helps to visualize trips into categories and record data into work and care ones. This approach will help users to recognize the importance of caring work and support transportation planners in designing systems that would fit all groups of the population.

The survey collects information on transport behavior and activities of people living in Ho Chi Minh City, 1150 people between the ages of 15 and 65, from all occupations and jobs. After removing invalid responses, there is a sample of around 1000. People working in the transportation sectors such as taxis, Buses, Grab, Gojek, Be, rental cars, etc., are excluded from the sample selection for analysis.

The questionnaire is designed for the specific research objectives described above, so it includes necessary information, such as demographics, time use for daily and weekly transport activities, transportation costs, vehicle ownership, and individual experience of public transport. The survey also asked participants about their employment and income, and employment status, to examine the relationship between different labor sectors and mobility patterns, the employment status is divided into subgroups including (full-time jobs with labor contracts, paid jobs without labor contracts, self-employed (owner-employer), self-employed (hired workers), unpaid family business, full-time housewives, and unemployment). In addition, the time spent on unpaid work inside the house was collected, including, time spent on doing housework, child care, and taking care of elders and ill people (see more detail the definition of variables in [Table A1](#)- Appendix A).

When designing the questionnaire and conducting a pilot test on 30 people, we found that categorical questions received higher and more precise responses than questions that required participants to fill in their own answers. Therefore, to increase the response rate and approximate accuracy, we designed questions related to time by providing categories for participants to answer (see an example in [Table A1](#)- Appendix A). Before the analysis; we used a random number selection algorithm within each category to assign to each response. By doing so, we still ensured approximate accuracy for questions related to time, also ensured the fluctuation of the observed variable, and took advantage of the strengths of quantitative analysis.

3.2 Descriptive statistics of the sample

Table 1 briefly describes the information on the main variables used in the analysis. Respondents' ages included in the analysis from 15 to 64 years old, with an average age of the respondent group being 35.48, of which 50% are under 35 years old and 25% are between 44-64 years old. The ratio of women and men in this study sample is 54% female and 46% male. The number of people who are married accounts for 55%. Most families have 4 members, with the typical family type in cities being a nuclear family with a husband, wife, and two children.

Table 1. Descriptive Statistics of the studied sample

	Mean	SD	p25	p50	p75
Age	35.48	12.04	25	35	44
Female	0.54	0.50	.	.	.
Married (1=yes)	0.55	0.50	.	.	.
Household Size	3.75	1.84	3	4	5
A. Time Traveling for Daily Activities					
work	1.41	1.06	0.69	1.21	1.85
education	0.60	0.87	0.00	0.14	0.93
escorting	0.34	0.57	0.00	0.06	0.49
shopping	0.42	0.49	0.09	0.30	0.51
others	0.47	0.65	0.00	0.24	0.72
Total	3.09	1.80	1.73	2.65	4.06
B. Time Traveling for Weekly Activities					
entertainment	0.85	0.89	0.23	0.60	1.10
visiting	0.61	0.70	0.11	0.39	0.86
health	0.32	0.45	0.00	0.19	0.43
social	0.35	0.60	0.00	0.02	0.46
Total	2.13	1.94	0.81	1.56	2.89
Monthly expense for transportation (in million VND)	842	1480	250	500	1000
C. Time Spending for in-house Daily Activities					
housework	0.90	0.79	0.37	0.74	1.19
childcare	0.53	0.84	0.00	0.00	0.84
take-care the elder & illness	0.16	0.45	0.00	0.00	0.00

Total unpaid work	1.59	1.46	0.62	1.15	2.11
Number of respondents	1047				

Note: the sample selection includes people from 15 to 64 years-old living in HCMC.

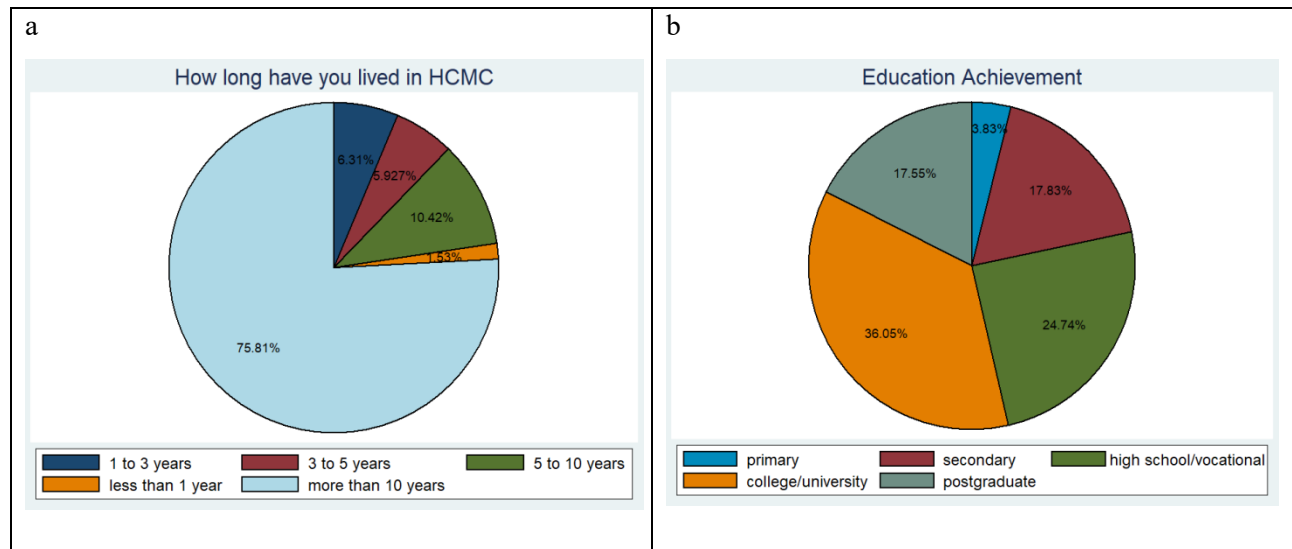
Source: authors' calculations based on survey.

[Table 1](#), section A describes the travel time for daily activities. In general, transportation in HCMC takes up quite a lot of time, mainly due to the traffic congestion caused by overloaded traffic, resulting in slow movement. Another factor is that HCMC is very large, so commuting from one district to another is common here. In this study sample, on average, they spend about 3.09 hours per day traveling on the road, with 50% of people spending more than 2.65 hours traveling and even 25% of people spending more than 4.06 hours traveling on the road. Of these, the time spent commuting to work accounts for the majority with an average of about 1.41 hours (including all travel for income-generating purposes such as going to the office or meeting business partners or delivering goods to customers, etc.), they spend 0.6 hours traveling for educational and training activities, traveling for escorting and shopping and other activities accounts for an average of about 0.34 hours, 0.42 hours and 0.47 hours respectively. One note is that in HCMC where motorbikes are the main means of transportation, for convenience and flexibility, most people often combine taking their children to school in the morning on their way to work and stopping at the markets to buy food on their way home in the afternoon.

[Table 1](#), section B describes the travel time for activities that do not occur regularly but usually occur weekly, such as outdoor entertainment activities, visiting relatives and friends, health check-ups or buying medicine, and social community activities. In this study sample, the average travel time on the roads that people spend per week is about 2.13 hours, of which travel time for entertainment and visiting is 0.85 hours and 0.61 hours respectively, while travel time for health care and social activities accounts for about 0.32 and 0.35 hours per week respectively.

We estimate the travel cost as a total, including the cost of buying gasoline, the cost of buying bus tickets, and the cost of transportation services such as taxis and motorbike taxis. With consumer prices at the time of data collection in April 2022, their average cost is 842,000 VND (equivalent to about 37 USD with the exchange rate at the time of this study), of which 50% of people spend less than 500,000 VND (equivalent to 22 USD) per month.

Figure 1: Time living in HCMC and Education achievement of the study sample

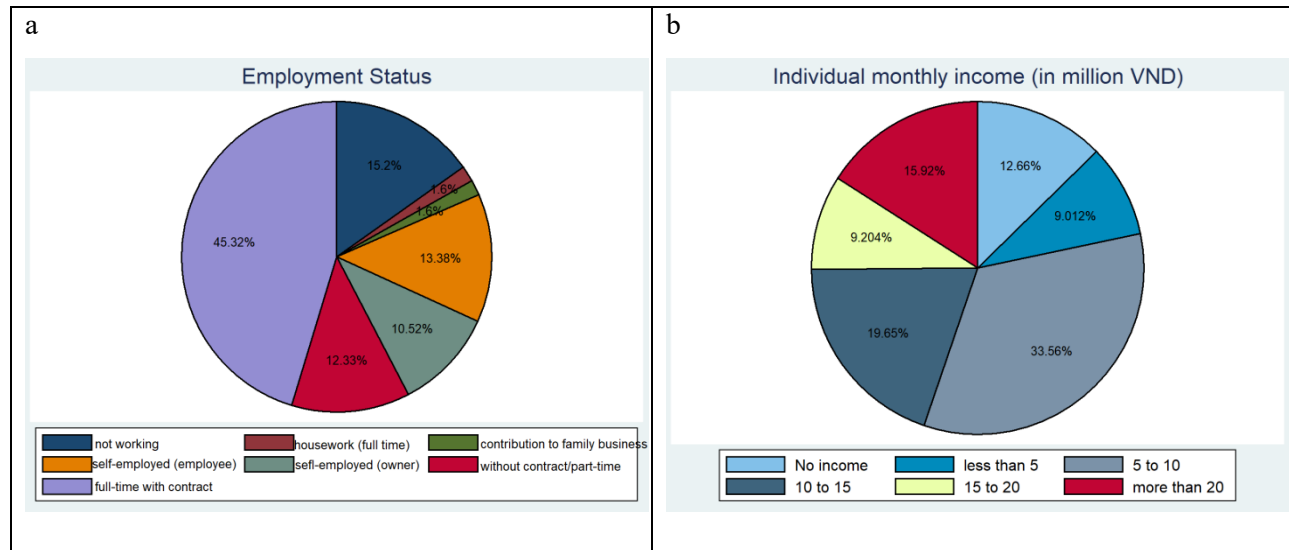


Note: the sample selection includes people from 15 to 64 years-old living in HCMC.

Source: authors' calculations based on survey.

More than 75% of the interviewees have lived in HCMC for over 10 years, and about 10.5% have lived here for 5-10 years. There are about 6% to 6.3% of people who have been here for 3-5 years or less than 3 years and only about 1.5% of people who have just arrived in HCMC for less than 1 year, they are mainly students. In this study sample, the number of people who graduated from high school or vocational school accounts for 24.7%, the number of people with university or college degrees is 36.05%, and about 17.5% have studied postgraduate level. Those who only graduated from primary school and junior high school are 3.8% and 17.8% respectively.

Figure 2: Employment status and Income of the study sample



Note: the sample selection includes people from 15 to 64 years-old living in HCMC.

Source: authors' calculations based on survey.

The employment status of the interviewees is diverse, including full-time work with a contract (45.32%), salaried work but without a labor contract or part-time/seasonal contract (12.33%), self-employed by working for another family or providing services when requested (13.38%), self-employed with small-scale business (10.52%), people working for their family business (1.6%), full-time housework (1.6%), and unemployed people (15.2%) including students who have not yet graduated.

The average monthly personal income varies in ranges, including 33.6% in the range of 5-10 million VND (equivalent to about 220USD-440USD with the exchange rate at the time of this study), which is also the average income in HCMC (the average monthly per capita income in HCMC in 2020 was 6.5 million VND) (GSO, 2021), approximately 9% of participants have an income lower than 5 million VND, about 19.6% have an income from 10 to 15 million VND, and about 9.2% have an income from 15 to 20 million VND. The number of people with an income above 20 million VND accounts for about 15.9%, and the number without income or not yet having an income is 12.66%.

[Table 1](#), section C describes the time that people spend on in-house daily activities, including housework (such as cooking, cleaning, gardening, etc.), childcare, and taking care of elderly or ill people. On average, they spend about 1.59 hours per day on unpaid work including the three types of work mentioned above, of which about 0.9 hours is used on housework, about 0.53 hours on childcare, and about 0.16 hours on taking care of elderly or ill people in the family. However, childcare and eldercare

activities depend on family circumstances, so most respondents spend no time on these activities, while a few people spend many hours a day on these two care activities.

3.3 Empirical strategy

The empirical analysis is performed following the random effect models. The interested indicators include travel times for different activities and time spent on unpaid work. To control for the bias originating in differences in characteristics between groups that could explain the differences in mobility, the individual and household characteristics are controlled, including age groups, education achievements, marital status, household size, and the number of children or older in the household.

The random effect models (RE) approach is used in this study to investigate the differences between women and men in time spent traveling and unpaid work.

$$T_i = \alpha_0 + \alpha_1 \text{Female} + \beta X_i + \varepsilon_i \quad (1)$$

Where T_i is interested indicators, are measured by the hours that an individual i spends for a specific activity. Female is a female dummy indicator. The vector X of control variables is controlled for observable characteristics, including age group, education, income, marital status, household size, and number of children or elderly in the family. The parameter estimate α_1 will give the mean of the difference between women to men. The error term ε_i standard at the individual level captures all unobservable factors.

Whereas equation (1) addresses hypotheses H1-H4, which investigate the differences between women and men in time spent in traffic and unpaid work. If differences exist, there is a hypothesis that women have traded time between unpaid work at home and participating in traffic outside. To test this hypothesis (H5), the following regression specification is used:

$$T_i = \alpha_0 + \alpha_1 U_{Wi} + \alpha_2 \text{Female} + \alpha_3 \text{Female} * U_{Wi} + \beta X_i + \varepsilon_i \quad (2)$$

Where T_i is the time for daily traveling activities, U_{Wi} is the total time used for daily unpaid work in-house. The interaction $\text{Female} * U_{Wi}$ assesses the correlation between the time used for unpaid work with time for traveling in the relationship with gender. The interested coefficient is α_3 , which will give the average marginal difference between women and men in trade-off traveling time for unpaid work.

4. Findings and discussions

In this section, we discuss the findings of the empirical analysis. First, we discuss the difference between men and women in the time spent traveling for daily and weekly activities. Second, we examine the

difference between men and women in the time they spend on activities at home, including both unpaid work and leisure. Third, we assess the hypothesis that women have traded travel time outside for unpaid work time at home. By controlling for factors through control variables in the model, comparisons are made for male and female groups of the same age, level of education and individual income, and similar family backgrounds (household size, number of children aged 0-5, number of children aged 6-14, number of elders in the house). Finally, we will discuss differences in traffic experiences among different groups according to gender, age, marital status, and level of education.

4.1 Gender differences in traveling activities.

In this section, we will examine gender differences in travel time for daily activities, including commuting, education, escorting, shopping, and others. Then, we will continue to examine gender differences in travel time for weekly activities, including entertainment, visiting, health care, and social services. Note that in this section, we do not discuss whether more traffic participation is good or bad; we only test traffic time differences through a gender lens. Although there is evidence of the impact of traffic participation on physical and mental health (Harrison et al., 2022; Lu et al., 2013; Wanner et al., 2012; Wilson et al., 2020), there is also evidence that there is a correlation between urban mobility and job opportunities and job quality (Blumenberg & Manville, 2004; Grengs, 2010). The correlation between mobility constraints and social exclusion (Akyelken, 2017). Therefore, examining to identify gender differences in traffic in HCMC to provide scientific evidence is the main purpose of this section.

Table 2. Traffic time by gender for daily activities (hours)

	(1)	(2)	(3)	(4)	(5)	(6)
	Total	Work	Education	Escort	Shop	Other
Female (Ref: Male)	-0.426***	-0.293***	-0.088	-0.087*	0.029	-0.084*
	(-3.73)	(-4.74)	(-1.76)	(-2.46)	(0.95)	(-2.07)
Married	-0.293	0.007	-0.250***	-0.002	-0.067	-0.136*
	(-1.74)	(0.08)	(-3.43)	(-0.04)	(-1.46)	(-2.27)
N	1011	1016	1019	1019	1019	1012
r2_a	0.0708	0.222	0.241	0.111	0.0416	0.116
Other control variables	Yes	Yes	Yes	Yes	Yes	Yes

Note: this table reports the main coefficient of interest (see the full results in [Table A2](#)-Appendix A). The sample selection includes people from 15 to 64 years-old living in HCMC. The standard errors are clustered at the individual level. Dependent variables: (1) Total traffic time for daily activities (2) Traffic time for work activities (3) Traffic time for education and training activities (4) Traffic time for escorting activities (5) Traffic time for shopping activities (6) Traffic time for other daily activities ; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

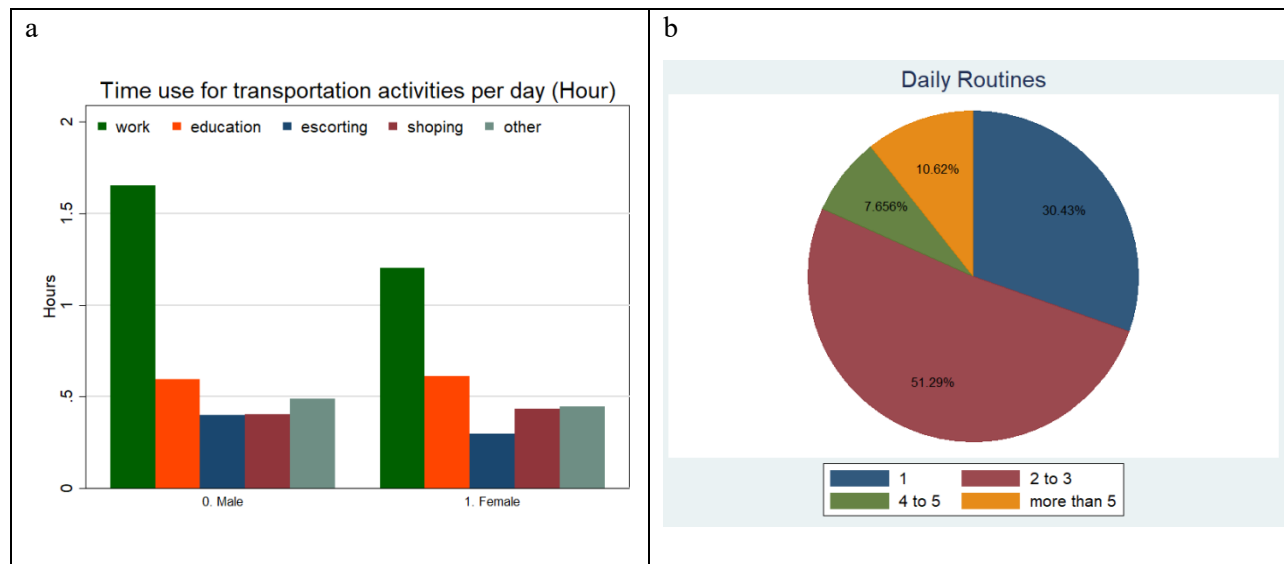
Source: authors' calculations based on survey.

Table 2 shows that women spend less time on daily traffic than men do. In total, for all daily activities, a woman spends 0.426 hours less than men. This difference is evident in most activities, with travel for work being the most pronounced. [Figure 3a](#) shows that on average, men spend about 1.65 hours on travel for work, while women spend an average of about 1.2 hours on this activity.

In Ho Chi Minh City, the main means of transportation is the motorbike, which is convenient for commuting and can easily combine different purposes on the same trip (Piazzoni & Jamme, 2020). [Figure 3b](#) shows that most people usually go to 2 to 3 destinations on their daily trips, so they can combine taking their children to school on their way to work and buying food on their way home in the evening. Therefore, the time spent on escorting and shopping may have been combined with travel for work. For the group of married people, row 2 in [Table 2](#) shows that they spend about one-third of an hour less on the

road than the group of unmarried people, specifically, they spend more time on travel for work and less time on education and training and other extracurricular activities. [Figure 4a](#) illustrates the specific differences between the two groups: married people spend an average of about 1.65 hours on travel for work while unmarried people spend only about 1.1 hours; conversely, unmarried people spend an average of about 0.96 hours on travel for education & training purposes while married people spend only about one-third of that time on the same activity.

Figure 3: Traffic time and Daily routines



Note: the sample selection includes people from 15 to 64 years-old living in HCMC.

Source: authors' calculations based on survey.

[Table 3](#) shows travel time for weekly activities, including travel time for entertainment, visiting relatives and friends, travel time for health activities, and travel time for social activities. Overall, there is no significant difference between women and men in travel time for weekly activities. The main difference is between the group of married people and the group of unmarried people, with married people spending less time on travel for entertainment and social activities than unmarried people. In total, married people spend 0.6 hours less per week on the above activities than unmarried people. [Figure 4b](#) illustrates the specific differences between the two groups: while unmarried people spend an average of 1.07 hours on travel for entertainment purposes and 0.4 hours on travel for social activities, married people spend only 0.67 hours and 0.3 hours on these activities, respectively.

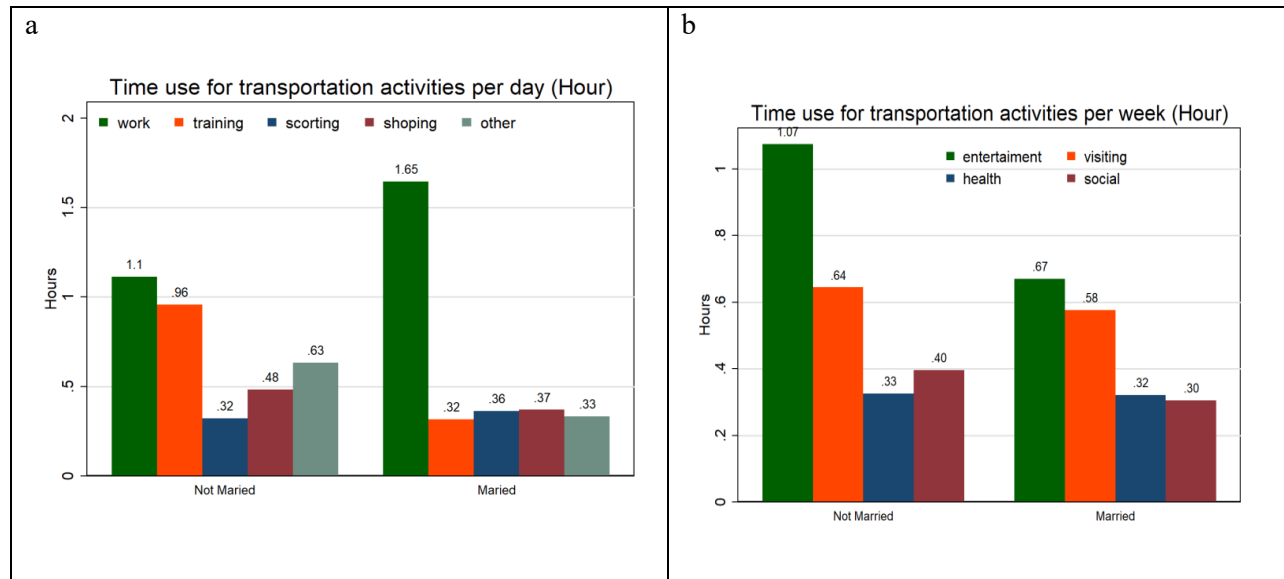
Table 3. Traffic time by gender for weekly activities (hours)

	(1)	(2)	(3)	(4)	(5)
	Total	Ent	Visit	Health	Social
Female (<i>Ref: Male</i>)	-0.150	-0.066	-0.024	-0.029	-0.027
	(-1.26)	(-1.22)	(-0.55)	(-1.00)	(-0.70)
Married	-0.607***	-0.335***	-0.044	-0.064	-0.144**
	(-3.46)	(-4.25)	(-0.67)	(-1.46)	(-2.60)
N	1016	1018	1019	1019	1017
r2_a	0.127	0.136	0.0659	0.00449	0.0684
Other control variables	Yes	Yes	Yes	Yes	Yes

Note: this table reports the main coefficient of interest (see the full results in [Table A3](#)- Appendix A). The sample selection includes people from 15 to 64 years-old living in HCMC. The standard errors are clustered at the individual level. Dependent variables: (1) Total traffic time for weekly activities (2) Traffic time for entertainment activities (3) Traffic time for visiting activities (4) Traffic time for health care activities (5) Traffic time for social activities ; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Source: authors' calculations based on survey.

Figure 4: Traffic times by married status



Note: the sample selection includes people from 15 to 64 years-old living in HCMC.

Source: authors' calculations based on survey.

4.2 Gender differences in house activities.

Global data shows that there has been an increase in female labor force participation and a decrease in the participation gap between men and women. However, in a publication by (Klasen et al., 2020), the authors found that progress has been uneven across regions. And, in almost every country, men remain more likely to participate in labor markets than women (Tzvetkova & Ortiz-Ospina, 2017). Once in the labor force, women typically occupy the worst-paid jobs with the least protection, and attitudes toward gender often hinder access to better opportunities (Scarpari & Clay, 2020). There is a gender disparity in vulnerable employment, with women being more than twice as likely to be found in the contributing family work category compared to men (ILO, 2018). Another study (Lo Bue et al., 2022) found that women are 7 percentage points more likely to be vulnerably employed than comparable men and the experiences of marriage and parenthood generate an important wedge between male and female vulnerable employment propensities. For women to be economically and socially empowered, it is necessary to increase both the quantity and quality of jobs for women and address gender barriers in accessing job opportunities and segregation in labor markets. Women have joined the workforce much more than before, but their traditional responsibility for home and family still has not changed. This can cause stress for women who have to juggle different roles and tasks at work and home. Studies show that this stress affects women's physical and mental health both during and after work hours, and can lead to problems such as heart disease and muscle pains. Moreover, women have fewer chances to advance in

their careers than men because of their multiple role demands. These data show that it is important to change how work is divided between men and women and to make work more flexible and empowering for both genders. This way, men and women can have both a fulfilling job and a satisfying family life (Lundberg, 1996).

Gender is a significant factor in shaping women's and men's patterns of unpaid work. The allocation of time between unpaid and paid work, the distribution of time among specific tasks of unpaid work, and the modes of care and responsibility for others are largely determined by gender. Women consistently devote more time to housework than men, regardless of their employment status; they also perform more of the work involved in childcare and assume more responsibility for that work; furthermore, women's volunteer activities tend to be more associated with family than men's. Several explanations have been proposed to account for the gendered patterns of time allocation for housework and childcare, but none of them can fully capture the gender differences in unpaid work time. The gender display perspective may offer some insights into the relationship between gender and unpaid work time, but its validity is difficult to assess directly. It remains evident that women's and men's participation in housework, childcare, and volunteer work differ substantially and that changes in women's labor force participation are not sufficient to eliminate gender disparities in unpaid work activities (Shelton, 2006).

The majority of research on gender and unpaid work concentrates on housework, although other forms of unpaid labor deserve consideration. In this study, we consider not only time spent on housework but also childcare time and taking care of elder or ill people in the house.

(Jokubauskaitė et al., 2022) suggested a new way to estimate the value of leisure, which is part of the value of travel time savings. Using data from Austria, the paper argues that unpaid work at home should be given a wage rate based. This affects the value of leisure of women more than men because women do more domestic work. The paper also found that the value of leisure becomes equal for both genders and the value of time assigned to travel increases for public transport.

In this section, we first want to examine gender differences in home activities in a modern city like HCMC, where the cost of living and education for children is very high compared to other cities in Vietnam (Bang, 2022). Therefore, in families, both men and women have to participate in the labor force to earn income for the family. Women in HCMC have a sense of responsibility to share financial obligations with men. So do they share responsibilities in-home activities? The answer shown in this section is that this sharing is not equal; the balance of unpaid work still leans more toward women.

Table 4. Time used by gender for daily unpaid work

	(1)	(2)	(3)	(4)	(5)
	Unpaid work	Housework	Childcare	Take care	Leisure
Female (Ref: Male)	0.552***	0.391***	0.169***	-0.008	-0.099
	(6.40)	(7.96)	(3.76)	(-0.28)	(-1.87)
Married	0.503***	0.073	0.537***	-0.108**	-0.346***
	(3.98)	(1.02)	(8.15)	(-2.70)	(-4.46)
N	1019	1019	1019	1019	1019
r2_a	0.192	0.0946	0.331	0.0926	0.278
Other control variables	Yes	Yes	Yes	Yes	Yes

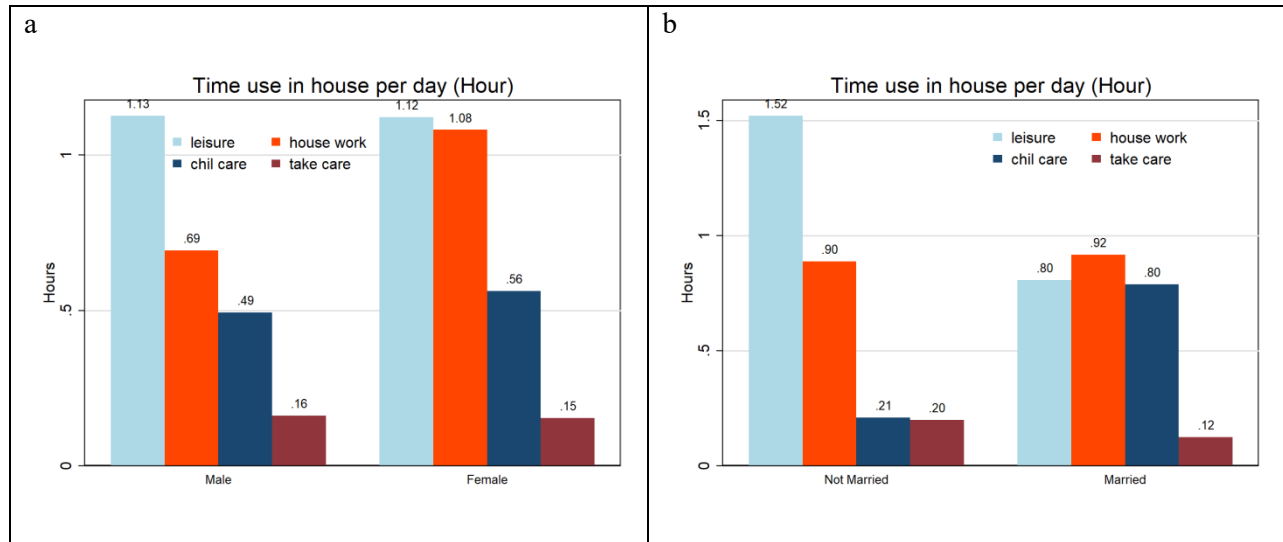
Note: this table reports the main coefficient of interest (see the full results in [Table A4-Appendix A](#)). The sample selection includes people from 15 to 64 years-old living in HCMC. The standard errors are clustered at the individual level. Dependent variables: (1) Total time used for daily unpaid work (2) Time used for housework activities (3) Time used for childcare activities (4) Time used to take care of elders & illness activities (5) Leisure time for personal activities; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Source: authors' calculations based on survey.

[Table 4](#) shows the difference in time spent on unpaid work activities by women and men. Clear evidence is that women spend 0.55 hours more per day than men on unpaid activities, including housework, childcare, and care for the elderly and illness, with the most significant being the two types of housework (nearly 0.4 hours more than men) and childcare (note that leisure time is not an activity counted in unpaid work). In [Table 4](#), the difference between the group of married and unmarried people is very clear in their roles in the family; married people naturally have to spend more time on childcare and compensate for this by spending less time on caring for the elderly and personal leisure time than unmarried people. The difference is illustrated by [Figure 5a](#), where men spend an average of 0.69 hours per day on housework while women spend an average of 1.08 hours on housework. And the total time men spend on unpaid work is 1.34 hours per day while that of women is 1.79 hours. [Figure 5b](#) shows the exchange of leisure time for unpaid work between the group of unmarried people and the group of married people; while unmarried people have an average of 1.52 hours per day for leisure activities, married people have only

half that amount (0.8 hours). Conversely, married people spend an average of 1.84 hours per day on unpaid work, while unmarried people spend only about 1.3 hours per day on this type of work.

Figure 5: Time used for daily in-house activities (hours)



Note: the sample selection includes people from 15 to 64 years-old living in HCMC.

Source: authors' calculations based on survey.

4.3 The correlation between traveling activity and gender roles in the family.

The results from the two previous sections show that there are gender differences in time spent on travel outside and time spent on activities in-house. These results indicate that women generally spend more time on activities in-house than men and spend less time traveling outside than men. A question arises whether there is a trade-off between travel time and housework time. This section will provide an answer through a gender lens.

Table 5. Time used by gender for unpaid work versus daily traffic time

Traveling hours	(1)	(2)	(3)	(4)	(5)	(6)
	Total	Work	Edu	Escort	Shop	Other
Unpaid work	0.516***	0.101**	0.186***	0.175***	0.129***	0.122***
	(8.91)	(3.12)	(7.29)	(9.73)	(8.04)	(5.80)

Female # Unpaid work (<i>Ref: Male</i>)	-0.366*** (-4.94)	-0.131** (-3.15)	-0.171*** (-5.24)	-0.077*** (-3.35)	-0.084*** (-4.08)	-0.107*** (-3.94)
N	1023	1028	1031	1031	1031	1024
r2_a	0.134	0.228	0.271	0.163	0.0972	0.134
Other control variables	Yes	Yes	Yes	Yes	Yes	Yes

Note: this table reports the main coefficient of interest (see the full results in [Table A5](#)-Appendix A). The sample selection includes people from 15 to 64 years-old living in HCMC. The standard errors are clustered at the individual level. Dependent variables: (1) Total traffic time for daily activities (2) Traffic time for work activities (3) Traffic time for education and training activities (4) Traffic time for escorting activities (5) Traffic time for shopping activities (6) Traffic time for other daily activities ; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Source: authors' calculations based on survey.

To test hypothesis H5 that there is a correlation between traffic participation time and gender roles in the family, we examine the correlation between time spent on unpaid work and daily traffic times. In Table 5, the coefficient of interest is the interaction term Female*Unpaid work, which shows that the difference between women and men in the correlation between time spent on unpaid work and daily traffic times is extremely significant. The second row shows that compared to men, if women spend an additional hour on housework, they will reduce their travel time by about 0.446 hours, mainly by reducing time spent on travel for work, education & training activities, and other extracurricular activities. This suggests that women who spend more time on unpaid work will tend to choose jobs that require less travel to save time. This may cause them to trade off better job opportunities (Scarpari & Clay, 2020). It also reflected this fact in the statistics that more than half of women say that a workplace close to home is an important factor when choosing a job (see [Figure B1](#)-Appendix B).

Table 6. Time used by gender for unpaid work versus weekly traffic time

	(1)	(2)	(3)	(4)	(5)
	Total	Ent	Visit	Health	Social
Unpaid work	0.585***	0.161***	0.154***	0.152***	0.120***
	(9.69)	(5.70)	(6.72)	(10.24)	(6.11)
Female # Unpaid work (<i>Ref: Male</i>)	-0.446***	-0.143***	-0.096**	-0.106***	-0.102***
	(-5.77)	(-3.95)	(-3.28)	(-5.57)	(-4.06)
N	1028	1030	1031	1031	1029
r2_a	0.192	0.142	0.111	0.106	0.0893
Other control variables	Yes	Yes	Yes	Yes	Yes

Note: this table reports the main coefficient of interest (see full results in [Table A6-Appendix A](#)). The sample selection includes people from 15 to 64 years-old living in HCMC. The standard errors are clustered at the individual level. Dependent variables: (1) Total traffic time for weekly activities (2) Traffic time for entertainment activities (3) Traffic time for visiting activities (4) Traffic time for health care activities (5) Traffic time for social activities ; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Source: authors' calculations based on survey.

Similarly, we examine the correlation between time spent on unpaid work and weekly traffic times. In [Table 6](#), the coefficient of interest is the interaction term Female*Unpaid work, which shows the difference between women and men in the correlation between time spent on unpaid work and weekly traffic times. In the second row, compared to men, if a woman increases her housework time by one hour per day, she will reduce her weekly travel time by about 0.446 hours per week, including travel for entertainment, visiting, health care, and social activities.

4.4 Gender differences in transportation modes and traffic experiences.

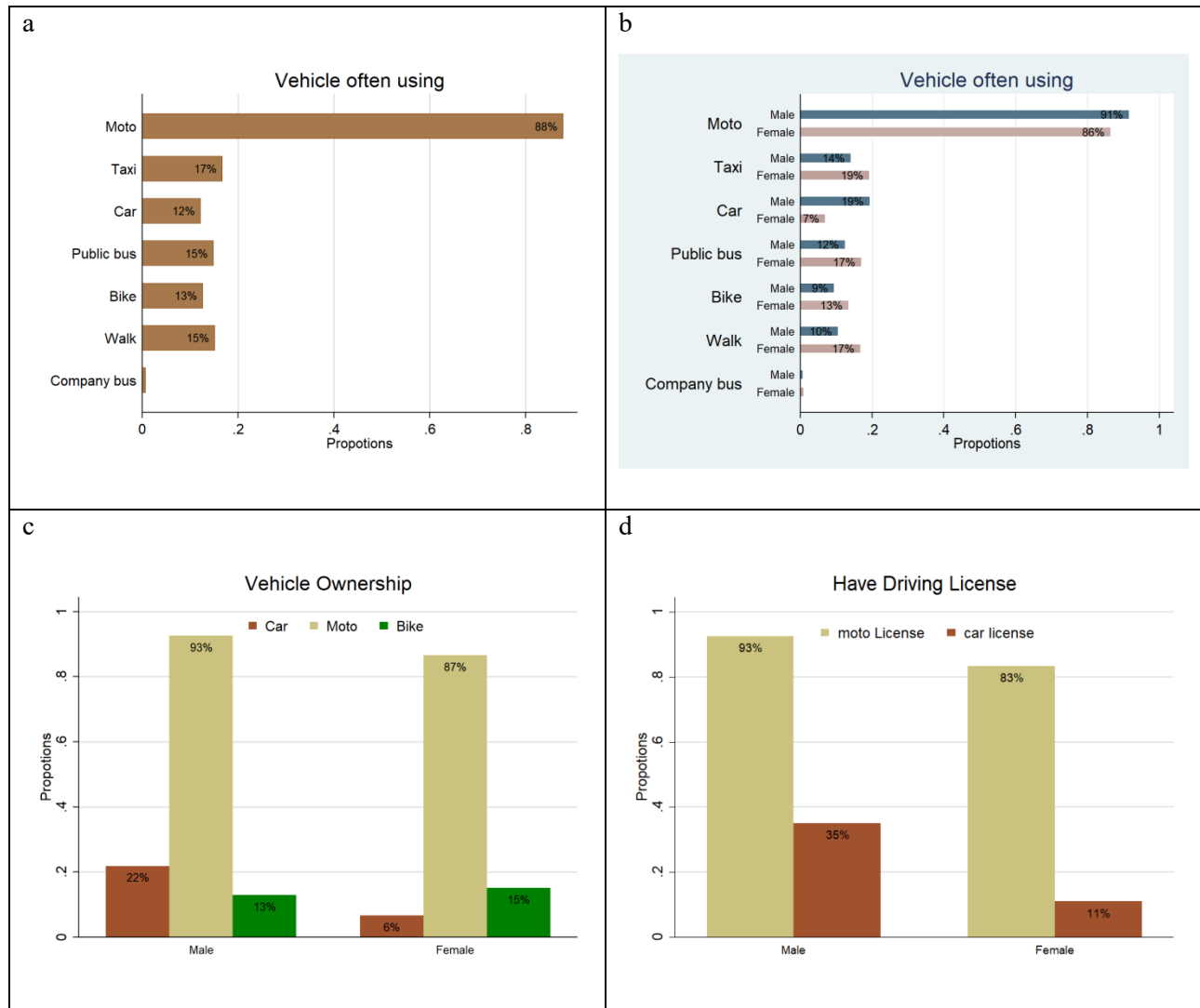
In this section, we discuss the different characteristics of transportation modes and traffic experiences of different groups, focusing on gender differences.

Use of transportation modes (people over 18 years old).

In Vietnam, in general, motorbikes are the most popular means of transportation, with a rate of 82.3% of the total number of vehicles used nationwide (Statista, 2022). One reason why motorbikes are popular in Vietnam is that the streets are very narrow. Cars are too big to drive in traffic jams and to find parking spaces. Motorbikes are more convenient and can move easily through crowds. Another reason is that motorbikes are cheaper than cars. A new motorbike costs around US\$1,000 or less, and a used one might be bought for a few hundred dollars. A new car, on the other hand, costs at least ten thousand dollars. That's why motorbikes are everywhere in Vietnam.

In this study, [Figure 6a](#) shows that 88% of respondents reported that motorcycles are their most frequently used mode of transportation, while 17% reported that taxis are also a frequently used mode of transportation. The number of people using taxis as a means of transportation in HCMC has increased significantly in recent years, the taxi service in HCMC developing strongly with more than 20 traditional taxi companies and about 10 technology-based taxi companies (SEC, 2023). Meanwhile, only 15% of respondents reported using buses frequently, a high figure compared to the national average of less than 5% (Statista, 2022). Frequent bus users are typically young students or retired seniors. In HCMC, the infrastructure is not conducive to walking and cycling. Although there are sidewalks for pedestrians, they are often occupied by businesses using them as parking spaces for customers and employees, or restaurants business placing tables and chairs on the sidewalks for customers to sit, making walking difficult (Bui, 2023) (illustrated [photo1](#) in Appendix C). There are no dedicated bike lanes throughout HCMC, so cyclists must share the road with larger vehicles, which is not safe (illustrated [photo 2](#) in Appendix C). As a result, choosing to ride a bike is mainly for short distances by older people (see [Figure B2](#) –Appendix B).

Figure 6: Vehicle use and ownership



Note: the sample selection includes people from 15 to 64 years-old living in HCMC.

Source: authors' calculations based on survey.

In a dynamic city like HCMC, both women and men actively participate in socio-economic activities. The socio-cultural environment in HCMC fundamentally poses no barriers for women to choose their means of transportation. The differences might be due to gender-related psychological factors; for example, women tend to choose safer modes of transportation when possible. [Figure 6b](#) reflects this reality, with self-driven vehicles such as motorcycles and cars, the percentage of men who frequently use them is 91% and 19%, while for women it is 86% and 7%, respectively. These percentages also correspond to vehicle ownership and having a driving license in [Figures 6c & 6d](#), where the percentage of men owning vehicles and having a driving license is higher than that of women for both motorcycles and cars. Also, [Figure 6b](#),

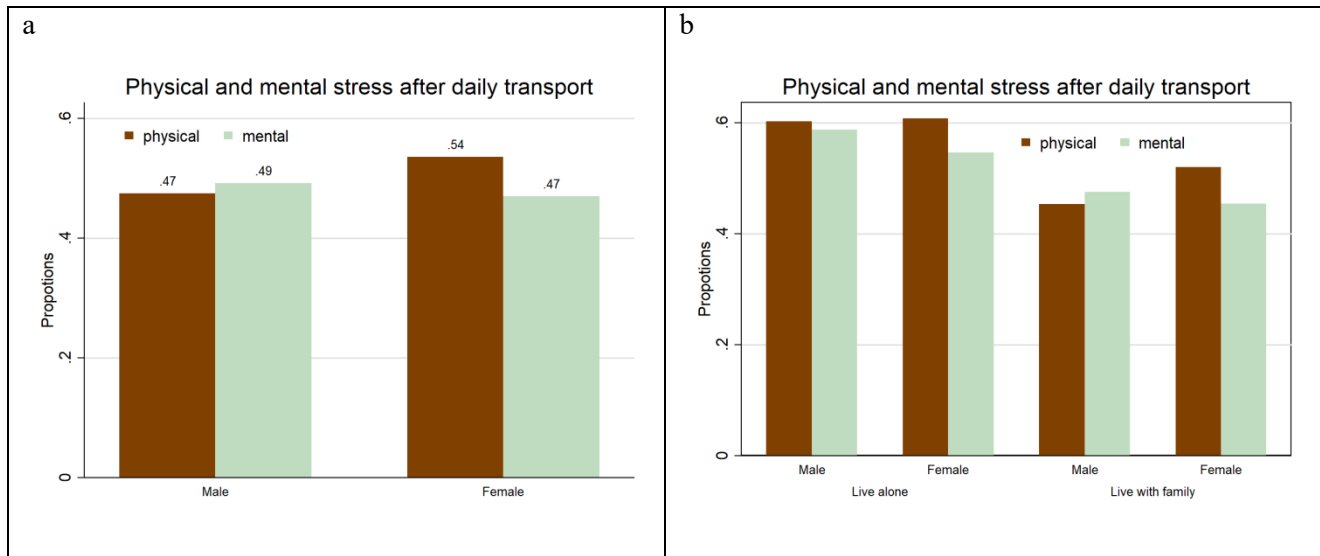
shows that the percentage of women choosing public buses, bikes, and walking is higher than that of men. However, the transportation infrastructure in HCMC is not yet well developed for these three modes. From this finding, we can see that investing in transportation infrastructure and public transportation, bike lanes, and well-managed pedestrian paths will support the mobility of all citizens, including women who frequently use these modes.

Physical and mental health

Traffic congestion and air pollution are causes of physical and mental health problems for road users, especially in a large city like HCMC. Most roads are congested during peak hours (Chi, 2023) (illustrated [photo3](#)-Appendix C). During the rainy season in HCMC, flooding occurs due to tidal water rising from the Saigon River while the drainage system cannot handle it, causing roads to be flooded (illustrated [photo4](#)-Appendix C). Heavy rain also causes trees to fall and obstruct traffic (VOV News, 2020) (illustrated [photo5](#)-Appendix C). In such difficult traffic conditions, daily commuting in the city creates stress. In [Figure 7a](#), about half of the respondents frequently experience physical and mental stress. Women seem to experience more physical stress than men, possibly because of their smaller bodies but they also have to control motorcycles the same size as men do. Women also often travel with young children and groceries. The weather in HCMC is hot all year round, and women have a habit of covering themselves to protect their bodies. This also makes it more difficult to control motorcycles and makes them feel stressed (illustrated [photo6](#)-Appendix C). In addition, women are also victims of traffic jams and snatch thefts (illustrated [photo7](#)-Appendix C). Good infrastructure and convenient public transportation will support women in commuting in HCMC, helping them feel more confident when participating in traffic and socio-economic activities.

An interesting surprise in [Figure 7b](#) is that the percentage of people living alone who feel stressed is higher than those living with their families. This may be due to the subjective psychology of those who live alone and face loneliness after returning home from work because they have no one to share their frustrations with on the road. We need further research on the impact on health and the stress caused by traffic.

Figure 7: Physical and mental health after daily transport



Note: the sample selection includes people from 15 to 64 years-old living in HCMC.

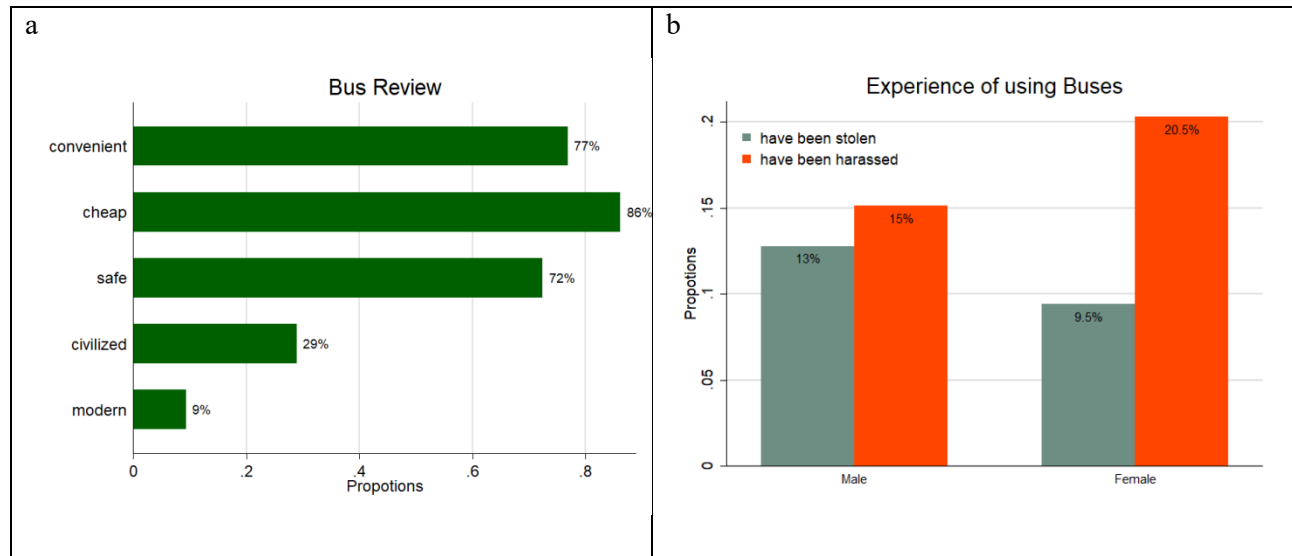
Source: authors' calculations based on survey.

Using Buses experiences.

There are 32 transport companies that provide buses in Ho Chi Minh City on different routes under the common management of the Ho Chi Minh City Public Transport Management Center (Info, 2023). To encourage people to take buses and reduce personal vehicles on the road, most bus routes are subsidized and have low fares, and the city also has a policy of free tickets for the elderly, people with disabilities, and students. However, the number of bus passengers is still quite low compared to expectations and tends to decrease in recent years (Huu, 2022). In this study, the results illustrated in [Figure 8](#), most participants rated buses in Ho Chi Minh City as cheap (5000-15000 VND equivalent to 25-60 cents), convenient, and safe, but they did not rate highly the modernity and civility of buses, which could be the reason why buses are not chosen as a regular means of transportation.

Up to one-fifth of bus users have had negative experiences with buses, such as theft or harassment by actions or offensive words. Among them, the percentage of women who have been harassed is about 20.5%, while for men it is 15%. In addition to the policy of increasing bus routes and investing in new buses, the city government needs to have a plan to control and promote the civilized use of public transportation for citizens.

Figure 8: Using bus experiences



Note: the sample selection includes people from 15 to 64 years-old living in HCMC.

Source: authors' calculations based on survey.

5. Conclusions

This paper aims to explore gender differences in traffic time and unpaid work in Ho Chi Minh City. We use a survey of 1150 people between the ages of 15 and 65, from different occupations and jobs to collect data on their transport behavior and activities. We apply random effect models to analyze the differences between women and men in time spent traveling and doing unpaid work. Our findings reveal the distinct transport patterns and behaviors of women and men, as well as their experience and affordability of public transportation. The testing models significantly supported four among five initiative hypotheses, including H1: women spend less in total traffic time than men do. H2: women spend less time in traffic for commuting activities than men do. H4: women spend more time doing unpaid work than men do. And H5: women trade traveling time outside for doing unpaid work inside. Hypothesis H3 is not supported by the empirical estimation, which states women spend more time in traffic for shopping and escorting activities than men do.

Several studies have explored the relationship between unpaid domestic work and employment, with a focus on gender differences. (Shelton, 2006) found that the time men spend at home and the types of jobs typically held by women are key factors in explaining unequal paid hours. Using Australian data, they highlighted the importance of considering men's time use (shorter paid hours, longer unpaid hours) along with improvements in jobs and work conditions to advance gender equality in employment. (Jokubauskaitė et al., 2022), using Austrian data, examined how unpaid domestic work influences the

gender gap in the value of leisure, which includes travel time. Our research is at the forefront of explaining the link between travel time and unpaid work by gender. We demonstrate the connection between urban mobility and gender roles. The research results imply that gender roles and norms shape the transport choices and preferences of women and men and that they have implications for decent work and economic growth. We suggest that public policies should take into account these gender differences and address the barriers and challenges that women face in accessing transport services.

6. Recommendations

This study highlights the links of new transport systems to women's economic empowerment. The following recommendations are based on research results and aim to integrate the gender focus into the transport policy dialogue and promote the country's transportation sector strategies vis-à-vis gender issues. The objective is to encourage the country's transportation policy and planning procedures to account for gender differences and to promote equal economic opportunities for the entire society by unlocking barriers to women's economic potential.

Transport planning and design should recognize the diversity of women's needs and preferences and ensure their consultation and involvement in decision-making processes. The transport policy and investment decisions should also address gender bias and consider women's needs and preferences.

Public transport should be made more accessible and affordable for women by offering flexible fares, subsidies, discounts, or vouchers for low-income and vulnerable people. The transport routes and schedules should also match women's travel patterns.

The safety and security of women in public transport should be improved by providing adequate lighting, CCTV cameras, emergency buttons, female-only carriages, and trained staff.

The quality and reliability of public buses should be improved as they are inexpensive and cover most of the city's districts and attractions. The city should invest in modernizing the bus fleet, enhancing the safety and comfort of passengers, and providing clear information on routes and schedules.

Public transport and active mobility should be made more inclusive and accessible for women by addressing the barriers and challenges they face, such as safety, affordability, reliability, convenience, and comfort. Moreover, public transport and active mobility should support women's access to economic opportunities by linking them to markets, services, education, health care, and social networks.

The improvement of cycling and walking requires the development of a network of dedicated cycling lanes that are separated from motorized traffic and connected to major destinations, such as schools,

markets, workplaces, and public transport stations. It also requires the provision of more facilities and incentives for cyclists and pedestrians, such as bike parking, bike sharing, electric bike, pedestrian crossings, sidewalks, and traffic signals. Moreover, it requires the raising of awareness and the promotion of a culture of cycling and walking among the public and the authorities, by organizing campaigns, events, workshops, and training programs to highlight the benefits of active mobility for health, environment, and economy. Furthermore, it requires the improvement of the safety and security of cyclists and pedestrians by enforcing traffic laws, reducing speed limits, installing CCTV cameras, providing adequate lighting, and preventing harassment and theft.

Findings from this research will be directly used to inform the HCMC department of urban transportation; will assist the municipal transport sector and all related agencies in designing their gender-inclusive projects. The dissemination of this research will draw significant attention to gender dimensions in public values and encourage gender mainstreaming across the transport sector. This is with the final target to promote and support gender equality and women's empowerment.

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Appendix A

Table A1. The definition of variables

Variable	Definition
Traffic time for work activities	The traffic time (hours) for commuting and income-generating work-related activities *
Traffic time for education and training activities	The traffic time (hours) for education and training activities *
Traffic time for escorting activities	The traffic time (hours) for escorting children or elderly/ family members activities *
Traffic time for shopping activities	The traffic time (hours) for daily family shopping activities *
Traffic time for other daily activities	The traffic time (hours) for daily other activities (not mentioned above)
Total traffic time for daily activities	The total traffic time (hours) for daily activities, including, work, education, and training, for escorting, for shopping, and other activities.
Traffic time for entertainment activities	The traffic time (hours) in one week for entertainment activities such as going to the movies, music, meeting friends, shopping, etc. *
Traffic time visiting activities	The traffic time (hours) in one week for visiting family members, relatives, friends, etc. *
Traffic time for health care activities	The traffic time (hours) in one week for health care activities such as going to hospitals, seeing doctors, going to pharmacies, etc. *
Traffic time for social activities	The traffic time (hours) in one week for social activities in the local areas *
Total traffic time for weekly activities	The total traffic time (hours) in one week for activities, including, entertainment, visiting, health care, and social activities *
Time used for housework activities	The time use (hours) in one day for housework activities,

	including, cooking, cleaning, gardening, etc. *
Time use for childcare activities	The time used (hours) in one day for taking care of children in the house *
Time used to take care of elders & illness activities	The time used (hours) in one day for taking care of elders and illness in the house *
Total time used for daily unpaid works	The total time used (hours) in one day for unpaid work, including, housework, childcare, taking care of elders, and illness
Leisure time for personal activities	The time used (hours) in one day for personal activities such as relaxing, entertaining, sporting, etc. *
Married (1/0)	A dummy variable for marital status, which takes the value 1 for currently married
Age groups	Categorical variable, which takes values 1-6 1: a group of 15-20 years old 2: a group of 21-30 years old 3: a group of 31-40 years old 4: a group of 41-50 years old 5: a group of 51-60 years old 6: a group of 61 - older
Education	Categorical variable, which takes values 0-6 0: No education 1: Primary not completed 2: Primary completed 3: Lower secondary completed

	4: High school / vocational completed 5: Some college / advanced vocational completed 6: University or higher
Income	Individual income is, a categorical variable, which takes values
Number of child 0-5 age	Number of children in the group of 0-5 years old in a family
Number of child 6-14 age	Number of children in the group of 6-14 years old in a family
Number of elders	Number of elderly people in a family
Household Size	Number of people living in a family

Source: authors' calculations based on survey.

Note *: The original questionnaires for time are categorical answers. Here is one example:

In ONE DAY, your traffic time for income-generating Work-related activities (such as going to work, delivering goods, going to meet partners,...) (Note: Only counted time for travel):

None

less than 30 minutes

between 30 -60 minutes

between 1-1.5 hours

between 1.5-2 hours

between 2-2.5 hours

between 2.5-3 hours

more than 3 hours

another number: ...

To create continuous variables for analysis, we used a random number selection algorithm within each category to assign to each response.

Table A2. Traffic time for daily activities (hours)

	(1)	(2)	(3)	(4)	(5)	(6)
	Total	Work	Education	Escort	Shop	Other
Female (Ref: Male)	-0.426***	-0.293***	-0.086	-0.087*	0.029	-0.084*
	(-3.73)	(-4.74)	(-1.76)	(-2.46)	(0.95)	(-2.07)
Married	-0.293	0.00684	-0.250***	-0.00223	-0.0671	-0.136*
	(-1.74)	(0.08)	(-3.43)	(-0.04)	(-1.46)	(-2.27)
Age groups (Ref: 15-20 ages)						
20s group	-0.224	0.164	-0.0897	-0.228**	0.0734	-0.196*
	(-0.94)	(1.27)	(-0.86)	(-3.10)	(1.12)	(-2.32)
30s group	-0.629*	0.201	-0.322*	-0.299***	-0.0825	-0.320**
	(-2.17)	(1.28)	(-2.56)	(-3.34)	(-1.03)	(-3.11)
40s group	-0.372	0.343*	-0.298*	-0.299**	-0.0646	-0.311**
	(-1.21)	(2.07)	(-2.25)	(-3.18)	(-0.77)	(-2.87)
50s group	-0.319	0.170	-0.245	-0.281**	0.0671	-0.253*
	(-0.95)	(0.93)	(-1.68)	(-2.72)	(0.73)	(-2.13)
60-65 group	-1.350*	-0.831**	-0.395	-0.234	0.0394	-0.263
	(-2.52)	(-2.86)	(-1.70)	(-1.41)	(0.27)	(-1.39)
Education (Ref: Primary)						
secondary	-0.457	-0.454*	0.0340	-0.113	0.0443	-
						0.00158

	(-1.40)	(-2.58)	(0.24)	(-1.12)	(0.49)	(-0.01)
high school /vocational	0.271	-0.583***	0.468***	0.0606	0.201*	0.287*
	(0.84)	(-3.32)	(3.32)	(0.60)	(2.24)	(2.49)
college/university	0.345	-0.874***	0.489***	0.0876	0.192*	0.426***
	(1.05)	(-4.93)	(3.43)	(0.87)	(2.13)	(3.66)
postgraduate	0.324	-0.968***	0.621***	0.134	0.120	0.332**
	(0.91)	(-5.03)	(4.02)	(1.22)	(1.22)	(2.63)
Income (in VND millions) (<i>Ref: no income</i>)						
less than 5	0.826**	0.609***	-0.154	0.295***	0.0876	0.152
	(3.24)	(4.41)	(-1.40)	(3.75)	(1.25)	(1.68)
5 – 10 group	0.721**	1.108***	-0.541***	0.264***	0.146*	0.0468
	(2.85)	(8.11)	(-4.93)	(3.38)	(2.10)	(0.52)
10- 15 group	0.725**	1.250***	-0.582***	0.137	0.151*	-0.0640
	(2.64)	(8.40)	(-4.87)	(1.62)	(1.99)	(-0.66)
15- 20 group	0.746*	1.214***	-0.544***	0.238*	0.143	-0.0762
	(2.34)	(7.05)	(-3.94)	(2.43)	(1.63)	(-0.67)
more than 20	0.567	1.127***	-0.586***	0.244*	0.116	0.0244
	(1.85)	(6.80)	(-4.41)	(2.58)	(1.38)	(0.22)
Number of child 0-5 age	0.278*	0.0689	0.0655	0.141***	0.0203	0.0230
	(2.55)	(1.17)	(1.39)	(4.21)	(0.68)	(0.60)
Number of child 6-14 age	0.217*	-0.0163	0.0371	0.198***	0.0268	0.0811*

	(2.38)	(-0.33)	(0.94)	(7.05)	(1.07)	(2.51)
Number of elders	0.158	-0.0274	0.0334	0.0692*	0.0766**	0.0745*
	(1.63)	(-0.52)	(0.79)	(2.31)	(2.87)	(2.16)
Household Size	-0.0568	0.00918	-0.000835	-0.0336*	-0.0215	-0.0296
	(-1.33)	(0.40)	(-0.05)	(-2.55)	(-1.83)	(-1.96)
Constant	3.036***	1.090***	1.003***	0.328**	0.227*	0.570***
	(8.22)	(5.44)	(6.25)	(2.87)	(2.23)	(4.35)
N	1011	1016	1019	1019	1019	1012
r ² _a	0.0708	0.222	0.241	0.111	0.0416	0.116
p	1.95e-11	3.38e-46	2.21e-51	8.10e-20	0.00000260	1.19e-20

Note: The sample selection includes people from 15 to 64 years old living in HCMC. The standard errors are clustered at the individual level. Dependent variables: (1) Total traffic time for daily activities (2) Traffic time for work activities (3) Traffic time for education and training activities (4) Traffic time for escorting activities (5) Traffic time for shopping activities (6) Traffic time for other daily activities ; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Source: authors' calculations based on survey.

Table A3. Traffic time for weekly activities (hours)

	(1)	(2)	(3)	(4)	(5)
	Total	Entrainment	Visit	Health	Social
Female (<i>Ref: Male</i>)	-0.150	-0.0655	-0.0243	-0.0298	-0.0266
	(-1.26)	(-1.22)	(-0.55)	(-1.00)	(-0.70)
Married	-0.607***	-0.335***	-0.0439	-0.0636	-0.144**
	(-3.46)	(-4.25)	(-0.67)	(-1.46)	(-2.60)

Age groups (Ref: 15-20 ages)					
20s group	-0.281	-0.0966	-0.0623	-0.0946	-0.0263
	(-1.13)	(-0.86)	(-0.67)	(-1.52)	(-0.33)
30s group	-0.256	-0.201	-0.0318	-0.0709	0.0324
	(-0.85)	(-1.47)	(-0.28)	(-0.94)	(0.34)
40s group	-0.283	-0.167	-0.107	-0.0769	0.0428
	(-0.89)	(-1.16)	(-0.90)	(-0.97)	(0.42)
50s group	0.00347	-0.158	0.0105	0.0172	0.113
	(0.01)	(-1.00)	(0.08)	(0.20)	(1.02)
60-65	0.245	-0.101	0.0818	-0.0342	0.154
	(0.43)	(-0.40)	(0.39)	(-0.24)	(0.84)
Education (Ref: Primary)					
Secondary	0.123	0.0643	0.0367	0.0173	-0.00648
	(0.36)	(0.42)	(0.29)	(0.20)	(-0.06)
High school/Vocational	0.949**	0.369*	0.238	0.0450	0.284**
	(2.80)	(2.42)	(1.88)	(0.53)	(2.64)
College/University	1.228***	0.495**	0.358**	0.0750	0.287**
	(3.59)	(3.20)	(2.80)	(0.88)	(2.64)
Postgraduate	1.563***	0.520**	0.528***	0.112	0.386**
	(4.21)	(3.11)	(3.80)	(1.20)	(3.28)
Income (in VND millions) (Ref: no income)					
Less than 5	0.0996	0.0531	-0.125	0.0644	0.109

	(0.38)	(0.44)	(-1.26)	(0.97)	(1.29)
5 to 10 group	0.00697	-0.0283	-0.109	0.0726	0.0740
	(0.03)	(-0.24)	(-1.11)	(1.10)	(0.89)
10 to 15 group	-0.00245	0.0406	-0.106	0.0690	0.00406
	(-0.01)	(0.31)	(-0.99)	(0.96)	(0.04)
15 to 20 group	0.0731	0.126	-0.159	0.0543	0.0608
	(0.22)	(0.84)	(-1.28)	(0.65)	(0.58)
More than 20 group	0.662*	0.305*	0.0688	0.150	0.139
	(2.07)	(2.12)	(0.58)	(1.87)	(1.37)
Number of child 0-5 age	0.0381	0.00321	-0.0180	0.0356	0.0136
	(0.34)	(0.06)	(-0.42)	(1.26)	(0.38)
Number of child 6-14 age	0.231*	0.0464	0.0513	0.0311	0.103***
	(2.44)	(1.08)	(1.45)	(1.31)	(3.42)
Number of elders	0.155	0.107*	0.00974	0.0104	0.0292
	(1.53)	(2.34)	(0.26)	(0.41)	(0.91)
Household Size	-0.0159	0.0130	-0.00686	-0.00579	-0.0148
	(-0.36)	(0.65)	(-0.41)	(-0.52)	(-1.05)
Constant	1.526***	0.670***	0.477***	0.292**	0.0895
	(3.96)	(3.85)	(3.31)	(3.03)	(0.73)
N	1016	1018	1019	1019	1017

r2_a	0.127	0.136	0.0659	0.00449	0.0684
p	3.36e-23	3.01e-25	1.30e-10	0.221	4.52e-11

Note: The sample selection includes people from 15 to 64 years-old living in HCMC. The standard errors are clustered at the individual level. Dependent variables: (1) Total traffic time for weekly activities (2) Traffic time for entertainment activities (3) Traffic time visiting activities (4) Traffic time for health care activities (5) Traffic time for social activities ; * p < 0.10, ** p < 0.05, *** p < 0.01.

Source: authors' calculations based on survey.

Table A4. Time used for unpaid work per day (hours)

	(1)	(2)	(3)	(4)	(5)
	Unpaid work	Housework	Childcare	Take care	Leisure
Female (Ref: Male)	0.552***	0.391***	0.169***	-0.00777	-0.0991
	(6.40)	(7.96)	(3.76)	(-0.28)	(-1.87)
Married	0.503***	0.0736	0.537***	-0.108**	-0.346***
	(3.98)	(1.02)	(8.15)	(-2.70)	(-4.46)
Age groups (Ref: 15-20 ages)					
20s group	-0.0280	0.123	-0.0654	-0.0856	-0.266*
	(-0.16)	(1.20)	(-0.70)	(-1.50)	(-2.40)
30s group	0.040	0.047	0.044	-0.051	-0.462***
	(0.18)	(0.38)	(0.39)	(-0.74)	(-3.44)
40s group	-0.127	0.0953	-0.160	-0.0619	-0.476***
	(-0.55)	(0.73)	(-1.33)	(-0.85)	(-3.37)
50s group	-0.037	0.323*	-0.323*	-0.0367	-0.364*
	(-0.15)	(2.24)	(-2.45)	(-0.46)	(-2.34)

60-65	0.860*	1.013***	-0.028	-0.126	-0.259
	(2.12)	(4.39)	(-0.13)	(-0.98)	(-1.04)
<i>Education (Ref: Primary)</i>					
secondary	-0.270	-0.190	-0.077	-0.004	0.053
	(-1.10)	(-1.35)	(-0.60)	(-0.05)	(0.35)
high school/vocational	0.039	-0.094	0.107	0.0262	0.311*
	(0.16)	(-0.67)	(0.84)	(0.34)	(2.07)
college/university	0.404	0.013	0.284*	0.108	0.501**
	(1.63)	(0.09)	(2.20)	(1.37)	(3.30)
postgraduate	0.698**	0.0739	0.469***	0.155	0.645***
	(2.60)	(0.48)	(3.35)	(1.83)	(3.91)
<i>Income (in VND millions) (Ref: no income)</i>					
less than 5	-0.019	-0.115	0.025	0.070	-0.259*
	(-0.10)	(-1.05)	(0.25)	(1.16)	(-2.20)
5 to 10	-0.100	-0.135	-0.025	0.059	-0.532***
	(-0.53)	(-1.24)	(-0.25)	(0.98)	(-4.55)
10 to 15	-0.330	-0.218	-0.136	0.024	-0.545***
	(-1.59)	(-1.84)	(-1.26)	(0.37)	(-4.28)
15 to 20	-0.199	-0.173	-0.103	0.078	-0.207
	(-0.83)	(-1.26)	(-0.83)	(1.02)	(-1.40)
more than 20	0.019	-0.120	0.053	0.086	-0.171
	(0.08)	(-0.91)	(0.44)	(1.17)	(-1.21)

Number of child 0-5 age	0.441*** (5.38)	0.059 (1.25)	0.372*** (8.70)	0.010 (0.40)	-0.145** (-2.88)
Number of child 6-14 age	0.319*** (4.64)	0.0917* (2.34)	0.207*** (5.78)	0.021 (0.95)	-0.016 (-0.39)
Number of elders	0.304*** (4.14)	0.098* (2.35)	0.057 (1.49)	0.149*** (6.40)	0.127** (2.83)
Household size	-0.066* (-2.04)	-0.059** (-3.20)	-0.019 (-1.11)	0.012 (1.13)	0.043* (2.16)
Constant	0.746** (2.67)	0.830*** (5.21)	-0.138 (-0.95)	0.054 (0.62)	1.554*** (9.07)
N	1019	1019	1019	1019	1019
r2_a	0.192	0.0946	0.331	0.0926	0.278
p	1.09e-38	2.81e-16	1.45e-77	7.16e-16	1.61e-61

Note: The sample selection includes people from 15 to 64 years-old living in HCMC. The standard errors are clustered at the individual level. Dependent variables: (1) Total time used for daily unpaid work (2) Time used for housework activities (3) Time used for childcare activities (4) Time used to take care of elders & illness activities (5) Leisure time for personal activities; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Source: authors' calculations based on survey.

Table A5. Time used for unpaid work versus daily traffic time

Traveling hours	(1)	(2)	(3)	(4)	(5)	(6)
	Total	Work	Edu	Escort	Shop	Other
Unpaid work	0.516***	0.101**	0.186***	0.175***	0.129***	0.122***

	(8.91)	(3.12)	(7.29)	(9.73)	(8.04)	(5.80)
Female (Ref: Male)	-0.024	-0.114	0.147*	-0.052	0.123**	0.048
	(-0.15)	(-1.29)	(2.11)	(-1.07)	(2.83)	(0.84)
Female # Unpaid work (<i>Ref: Male</i>)	-0.366***	-0.131**	-0.171***	-0.077***	-0.084***	-0.107***
	(-4.94)	(-3.15)	(-5.24)	(-3.35)	(-4.08)	(-3.94)
Age groups (Ref: 15-20 ages)						
20s group	-0.173	0.216	-0.093	-0.219**	0.066	-0.187*
	(-0.76)	(1.69)	(-0.93)	(-3.09)	(1.04)	(-2.25)
30s group	-0.763**	0.241	-0.471**	-0.262**	-0.152*	-0.378***
	(-2.92)	(1.65)	(-4.10)	(-3.23)	(-2.11)	(-3.97)
40s group	-0.541*	0.350*	-0.473***	-0.239**	-0.129	-0.367***
	(-2.00)	(2.32)	(-3.98)	(-2.85)	(-1.73)	(-3.73)
50s group	-0.580	0.197	-0.422**	-0.339***	0.004	-0.347**
	(-1.94)	(1.18)	(-3.21)	(-3.67)	(0.05)	(-3.19)
60-65	-1.692***	-0.504*	-0.577**	-0.467***	-0.112	-0.456**
	(-4.02)	(-2.14)	(-3.11)	(-3.58)	(-0.96)	(-2.98)
Education (<i>Ref: Primary</i>)						
secondary	-0.500	-0.514**	0.030	-0.115	0.0620	-0.00697
	(-1.61)	(-2.97)	(0.22)	(-1.19)	(0.72)	(-0.06)
high school/vocational	0.132	-0.663***	0.448**	0.00328	0.201*	0.270*
	(0.43)	(-3.84)	(3.30)	(0.03)	(2.36)	(2.41)

college/university	0.104	-0.983***	0.446**	0.002	0.168	0.396***
	(0.33)	(-5.64)	(3.25)	(0.03)	(1.95)	(3.49)
postgraduate	0.002	-1.084***	0.563***	-0.0187	0.084	0.285*
	(0.01)	(-5.76)	(3.80)	(-0.18)	(0.90)	(2.32)
Income (in VND millions) (<i>Ref: no income</i>)						
less than 5	0.826***	0.623***	-0.158	0.296***	0.085	0.124
	(3.38)	(4.56)	(-1.47)	(3.92)	(1.27)	(1.39)
5 to 10	0.617*	1.104***	-0.598***	0.238**	0.130*	-0.0179
	(2.58)	(8.26)	(-5.68)	(3.21)	(1.97)	(-0.21)
10 to 15	0.748**	1.267***	-0.604***	0.169*	0.166*	-0.0980
	(2.88)	(8.72)	(-5.28)	(2.10)	(2.31)	(-1.04)
15 to 20	0.737*	1.227***	-0.581***	0.263**	0.140	-0.113
	(2.43)	(7.25)	(-4.36)	(2.81)	(1.68)	(-1.03)
more than 20	0.442	1.128***	-0.654***	0.220*	0.082	-0.044
	(1.51)	(6.92)	(-5.09)	(2.43)	(1.01)	(-0.42)
Household size	0.004	0.01	-0.003	0.0218*	-0.015	-0.005
	(0.15)	(0.61)	(-0.20)	(2.38)	(-1.80)	(-0.46)
Constant	2.558***	1.019***	0.840***	0.139	0.097	0.426***
	(7.24)	(5.15)	(5.40)	(1.27)	(0.99)	(3.31)
N	1023	1028	1031	1031	1031	1024
r2_a	0.134	0.228	0.271	0.163	0.0972	0.134

p	1.71e-25	3.64e-49	1.79e-61	9.99e-33	1.59e-17	1.86e-25
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Note: The sample selection includes people from 15 to 64 years-old living in HCMC. The standard errors are clustered at the individual level. Dependent variables: (1) Total traffic time for daily activities (2) Traffic time for work activities (3) Traffic time for education and training activities (4) Traffic time for escorting activities (5) Traffic time for shopping activities (6) Traffic time for other daily activities ; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Source: authors' calculations based on survey.

Table A6. Time used for unpaid work versus weekly traffic time

	(1)	(2)	(3)	(4)	(5)
	Total	Ent	Visit	Health	Social
Unpaid work	0.585*** (9.69)	0.161*** (5.70)	0.154*** (6.72)	0.152*** (10.24)	0.120*** (6.11)
Female (Ref: Male)	0.414* (2.50)	0.137 (1.78)	0.0805 (1.29)	0.0877* (2.16)	0.110* (2.06)
Female # Unpaid work (Ref: Male)	-0.446*** (-5.77)	-0.143*** (-3.95)	-0.096** (-3.28)	-0.106*** (-5.57)	-0.102*** (-4.06)
Age groups (Ref: 15-20 ages)					
20s group	-0.372 (-1.57)	-0.150 (-1.35)	-0.074 (-0.82)	-0.092 (-1.58)	-0.053 (-0.69)
30s group	-0.705** (-2.59)	-0.443*** (-3.48)	-0.091 (-0.88)	-0.126 (-1.88)	-0.051 (-0.58)
40s group	-0.702* (-2.49)	-0.421** (-3.20)	-0.136 (-1.28)	-0.130 (-1.88)	-0.0241 (-0.26)

50s group	-0.481	-0.414**	-0.029	-0.035	-0.007
	(-1.55)	(-2.85)	(-0.25)	(-0.46)	(-0.07)
60-65	-0.553	-0.412*	-0.086	-0.089	-0.011
	(-1.24)	(-2.01)	(-0.51)	(-0.83)	(-0.08)
Education (<i>Ref: Primary</i>)					
secondary	0.185	0.086	0.061	0.033	-0.001
	(0.57)	(0.57)	(0.50)	(0.42)	(-0.00)
high school/vocational	0.921**	0.387*	0.229	0.031	0.266*
	(2.86)	(2.57)	(1.88)	(0.39)	(2.55)
college/university	1.129***	0.508***	0.313*	0.031	0.266*
	(3.47)	(3.34)	(2.55)	(0.39)	(2.53)
postgraduate	1.371***	0.533**	0.446***	0.040	0.340**
	(3.90)	(3.24)	(3.35)	(0.46)	(2.99)
Income (in VND millions) (<i>Ref: no income</i>)					
less than 5	0.09	0.044	-0.127	0.068	0.106
	(0.35)	(0.37)	(-1.32)	(1.09)	(1.29)
5 to 10	-0.154	-0.0971	-0.133	0.052	0.028
	(-0.62)	(-0.83)	(-1.41)	(0.84)	(0.34)
10 to 15	-0.0567	0.00246	-0.111	0.0793	-0.0142
	(-0.21)	(0.02)	(-1.08)	(1.19)	(-0.16)
15 to 20	-0.009	0.073	-0.165	0.044	0.048
	(-0.03)	(0.50)	(-1.38)	(0.57)	(0.47)

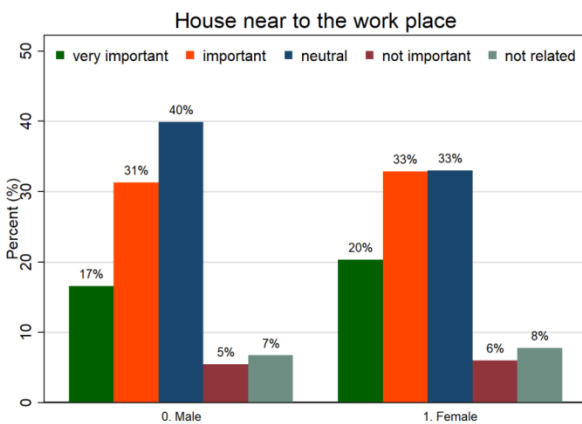
more than 20	0.490	0.248	0.037	0.115	0.094
	(1.61)	(1.75)	(0.32)	(1.54)	(0.96)
Household size	-0.019	0.007	-0.014	-0.008	-0.005
	(-0.62)	(0.52)	(-1.16)	(-1.02)	(-0.45)
Constant	1.063**	0.535**	0.372**	0.168	-0.013
	(2.89)	(3.11)	(2.67)	(1.85)	(-0.11)
N	1028	1030	1031	1031	1029
r ² _a	0.192	0.142	0.111	0.106	0.0893
p	7.63e-40	1.57e-27	1.24e-20	2.16e-19	7.79e-16

Note: The sample selection includes people from 15 to 64 years-old living in HCMC. The standard errors are clustered at the individual level. Dependent variables: (1) Total traffic time for weekly activities (2) Traffic time for entertainment activities (3) Traffic time visiting activities (4) Traffic time for health care activities (5) Traffic time for social activities ; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Source: authors' calculations based on survey.

Appendix B

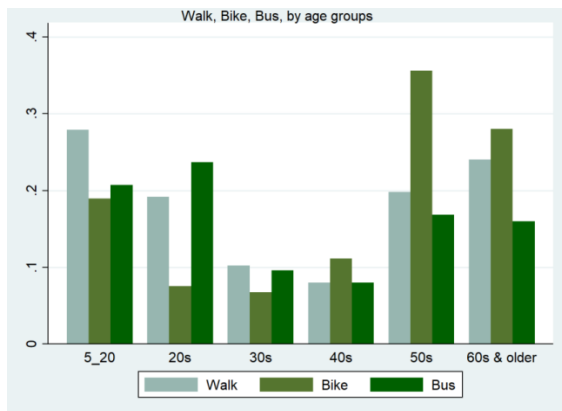
Figure B1. The importance of living near the workplace



Note: the sample selection includes people from 15 to 64 years-old living in HCMC.

Source: authors' calculations based on survey.

Figure B2. Walking, Circling, Using buses, by age groups



Note: the sample selection includes people from 15 to 64 years-old living in HCMC.

Source: authors' calculations based on survey.

Appendix C

Photo 1: Pedestrian sidewalks are encroached on by businesses



Source: photo in (Bui, 2023)

Photo 2: There are no lanes for cyclists on HCMC roads



Source: photo in (Nguyen & Nguyen, 2022)

Photo 3: Roads in HCM rush hours



Source: photo in (Chi, 2023)

Photo 4. Streets in the rainy season



Source: photo in (VOV News, 2020)

Photo 5: Streets in the rainy season



Source: photo in (Giang, 2020)

Photo 6. Women in HCMC when participating in traffic



Source: photo in (Hoang, 2021)

Photo 7: Women being harassed on the street



Source: photo in (Tu Quy, 2016)

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