CHAPTER 4
DATA ANALYSIS AND RESULTS

4.1 Introduction

In the previous chapter, a discussion was made about the methods employed to achieve our proposed objectives. This chapter aims to demonstrate the data analysis conducted and the results thus obtained.

We attempted to explore the first objective from different angles. We used descriptive statistics on Census data to understand the gender differences in travel behavior in rural-urban areas of Indian states. This was also complemented with a beta regression model to examine the influence of socio-demographic factors on travel choices in two selected states of India. Next, we make use of data from the same source and analyze the commuting patterns taking into account the area, gender, and regional differences in eight selected districts of Uttar Pradesh. This objective was also explored taking existing occupational differences into account. In another angle, we also attempted to inspect the varying impacts of socioeconomic factors on travel mode choice of men and women in rural and urban areas employing a multinomial logit model.

The second objective of our thesis is to examine the gender differences in travel behavior with respect to income. For this, we understand travel behavior differentiated by gender and socioeconomic status of individuals in the surveyed urban area using descriptive statistics. We then aim to understand the influence of socioeconomic factors on choice of type of mode of transport using a binary logit model on the survey data. From another perspective, using a binary logit model, we explore the influence of socio-demographic factors including socioeconomic status on transport mode choices for purposes other than work in the study area.

The third objective of our thesis is to suggest a policy framework for gender-sensitive transport planning. To fulfil this objective, we first explore if there exist gender differences in travel behavior using a univariate probit model, a bivariate probit model and a seemingly unrelated bivariate probit model. Once that is proven, we suggest certain policy measures which can be taken to tackle this gap while also underlining the response of public to these proposed policy measures. For the third objective, we also attempted to analyze if safety in public transport is a hurdle which is lowering its overall use. This is understood using a univariate probit model, a bivariate probit model and a seemingly unrelated bivariate probit model.

Taking our above-mentioned objectives into consideration, this chapter has been divided into three sections. The first section covers the data analysis and results obtained for the first objective. This section has again been split up into four parts. The second section of this chapter, which has also been divided into three parts, focusses on the data analysis and results of the second objective. The third and the final section of this chapter discusses the data analysis and obtained results for the third objective. This section has two broad parts.

4.2 Analysis and Discussion

4.2.1 Section-I

Overview

This section of the chapter gives a description of the results for the first objective. We aim to understand area and gender-based differences in travel patterns in India. To achieve this objective, we divide the remainder of this section into four parts. The first part explains travel behavior differences between rural and urban areas and between men and women among 27 states and eight union territories of India. It then also tries to examine the impact of certain socio-demographic factors on travel behavior of two selected states.

The second part of this section examines this objective of the thesis for one of the most populous states of India. The third and the fourth section explores this objective from the outlook of the surveyed locations of Rajasthan.

The analysis on this objective of the thesis has been presented in Saigal *et al.* (2020b; 2021a).

4.2.1.1 Part-I

Results and Discussion

In the first part of this paper, we aim to explore the variation in travel behavior among different states in India taking into account the area and gender characteristics.

Table 1: State percentage share in total transport use in India segregated by area and gender. Source: Author's own calculation of Census of India (2011g) data.

State	Rural		Urban		Total
	Male	Female	Male	Female	
Himachal Pradesh	1.27	0.99	0.21	0.24	0.63
Punjab	3.24	2.72	2.98	2.57	2.99
Karnataka	5.49	6.65	6.76	8.99	6.60
Uttarakhand	1.11	0.81	0.81	0.63	0.89

Haryana	2.60	1.95	2.29	1.96	2.32
Tamil Nadu	6.79	7.32	9.60	12.70	8.81
Rajasthan	6.60	7.80	4.33	3.22	5.29
Uttar Pradesh	14.05	13.83	9.95	7.93	11.44
Bihar	6.44	5.83	2.22	1.67	3.88
Sikkim	0.11	0.13	0.05	0.08	0.08
Arunachal Pradesh	0.15	0.18	0.09	0.12	0.12
Nagaland	0.19	0.25	0.14	0.23	0.17
Manipur	0.30	0.44	0.16	0.38	0.26
Mizoram	0.04	0.06	0.12	0.27	0.10
Tripura	0.52	0.59	0.27	0.30	0.39
Meghalaya	0.28	0.45	0.14	0.29	0.24
Assam	4.61	5.52	1.28	1.23	2.78
West Bengal	9.54	7.68	8.15	7.58	8.48
Jharkhand	2.83	2.41	1.90	1.38	2.19
Odisha	4.56	4.26	1.85	1.76	2.95
Chhattisgarh	1.35	1.34	1.49	1.60	1.45
Madhya Pradesh	3.40	3.75	4.91	4.67	4.28
Gujarat	4.08	5.07	7.83	5.17	6.06
Kerala	5.15	5.90	3.89	5.40	4.67
Andhra Pradesh	6.78	6.89	7.24	8.94	7.25
Maharashtra	6.24	5.52	14.56	15.31	11.05
Goa	0.19	0.19	0.27	0.40	0.25
Union Territories					
Andaman & Nicobar Islands	0.09	0.06	0.05	0.05	0.06
Chandigarh	0.02	0.01	0.33	0.33	0.20
Dadra & Nagar Haveli	0.05	0.03	0.07	0.04	0.05
Daman & Diu	0.03	0.01	0.09	0.04	0.06
NCT of Delhi	0.14	0.06	4.77	3.46	2.66

Jammu & Kashmir	1.64	1.23	0.95	0.76	1.18
Lakshadweep	0.01	0.00	0.01	0.01	0.01
Puducherry	0.10	0.08	0.23	0.29	0.18

Table 1 sets forth states' share in total transport use in the country. While Uttar Pradesh alone accounts for more than one-tenth of the use, the state with minimum use is Sikkim. NCT of Delhi contributes a considerable share among the list of union territories in India. Among all urban regions of the country, the contribution of the state of Maharashtra is the highest while that of Sikkim is the lowest. Uttar Pradesh accounts for more than one-fourth of the use in rural area while the use by Mizoram is the most negligible. Both men and women in Uttar Pradesh record the highest use in their respective categories in rural area. The state also displays one of the broadest gender gaps in total mode use.

Figure 2: Gender gap in total mode use in rural India. Source: Author's own calculation of Census of India (2011g) data.
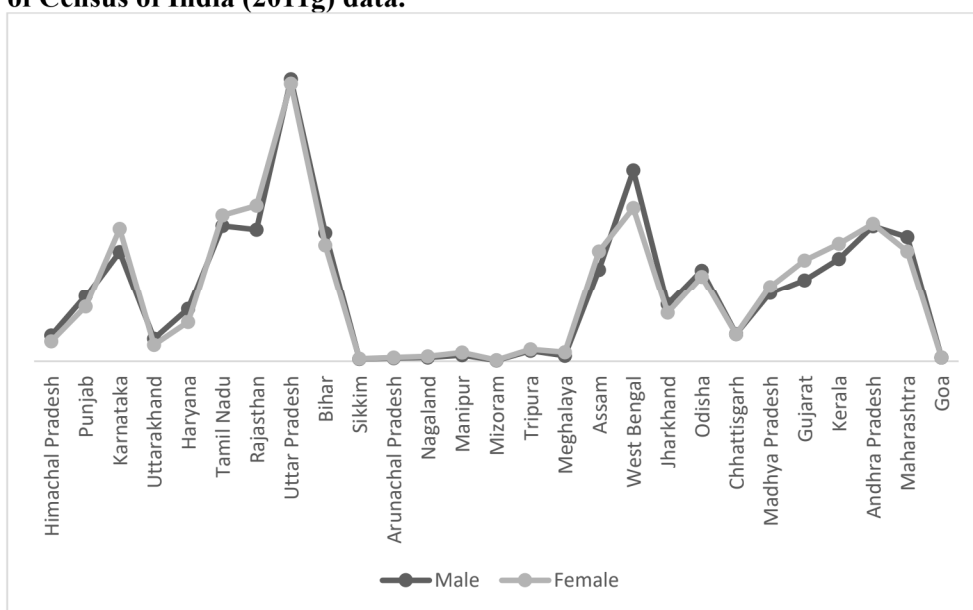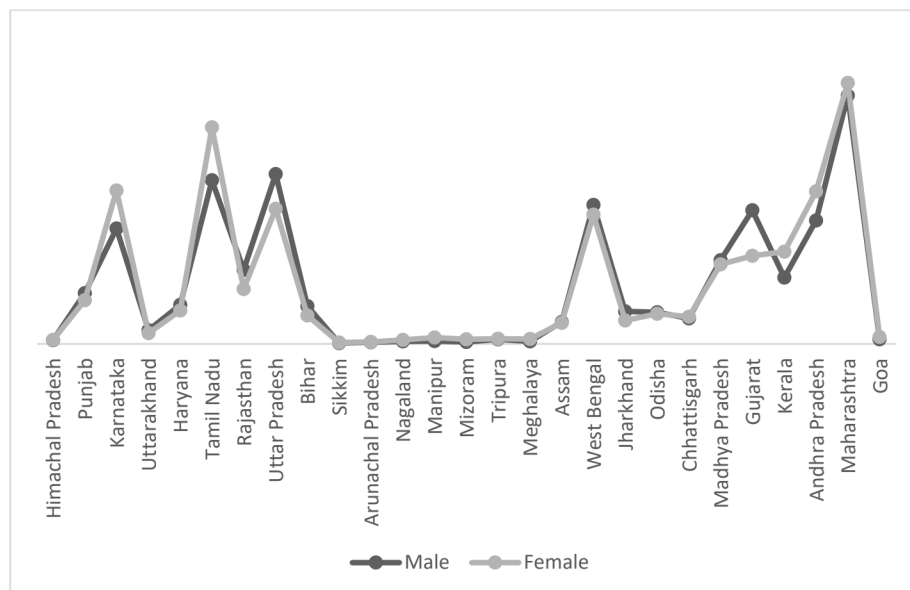
Figure 3: Gender gap in total mode use in urban India. Source: Author's own calculation of Census of India (2011g) data.

Figures 2 and 3 show gender differences in mode of transport use in rural and urban area respectively. In the rural area, while West Bengal exhibits huge gender gap in mode use in favor of men, Rajasthan depicts the same in favor of women. Similarly, urban Gujarat has the greatest gap in mode use in favor of men while the otherwise is found true for urban area of Tamil Nadu.

Table 2: Share of each state in total motorized transport use of the country separated by gender and area. Source: Author's own calculation of Census of India (2011g) data.

State	Rural		Urban		Total	
	Male	**Female**	**Male**	**Female**	**Male**	**Female**
Himachal Pradesh	0.24	0.02	0.08	0.01	0.32	0.03
Punjab	0.99	0.09	2.45	0.33	3.44	0.43
Uttarakhand	0.85	0.08	0.31	0.02	0.55	0.06
Haryana	0.70	0.03	1.79	0.25	2.49	0.28
Rajasthan	1.97	0.09	3.79	0.31	5.75	0.40
Uttar Pradesh	2.35	0.16	5.30	0.47	7.65	0.63

Bihar	0.86	0.09	0.86	0.07	1.72	0.15
Sikkim	0.03	0.01	0.02	0.01	0.05	0.02
Arunachal Pradesh	0.03	0.01	0.04	0.01	0.07	0.02
Nagaland	0.03	0.01	0.05	0.01	0.09	0.02
Manipur	0.06	0.02	0.10	0.04	0.16	0.05
Mizoram	0.01	0.00	0.06	0.02	0.06	0.02
Tripura	0.09	0.01	0.11	0.01	0.21	0.02
Meghalaya	0.06	0.02	0.06	0.03	0.12	0.04
Assam	0.59	0.05	0.63	0.07	1.23	0.12
West Bengal	1.03	0.08	1.95	0.19	2.97	0.27
Jharkhand	0.51	0.04	1.39	0.09	1.90	0.13
Odisha	1.05	0.08	1.52	0.14	2.58	0.22
Chhattisgarh	0.48	0.05	1.26	0.15	1.74	0.20
Madhya Pradesh	0.74	0.06	3.40	0.38	4.15	0.44
Gujarat	1.53	0.12	7.75	0.60	9.27	0.73
Maharashtra	2.52	0.20	9.07	1.27	11.59	1.47
Andhra Pradesh	1.34	0.08	5.09	0.41	6.43	0.50
Karnataka	1.19	0.13	5.25	0.66	6.44	0.79
Goa	0.12	0.01	0.30	0.05	0.42	0.07
Kerala	1.36	0.12	2.34	0.25	3.70	0.36
Tamil Nadu	2.22	0.30	7.89	0.84	10.11	1.14
Union Territories						
Andaman & Nicobar Islands	0.03	0.00	0.04	0.01	0.07	0.01
Chandigarh	0.01	0.00	0.34	0.08	0.35	0.08
Dadra & Nagar Haveli	0.01	0.00	0.04	0.00	0.06	0.00
Daman & Diu	0.01	0.00	0.04	0.00	0.05	0.00
NCT of Delhi	0.05	0.00	3.79	0.44	3.84	0.44
Jammu & Kashmir	0.15	0.01	0.33	0.04	0.47	0.05
Lakshadweep	0.00	0.00	0.01	0.00	0.01	0.00

Puducherry	0.06	0.00	0.30	0.04	0.37	0.05
India	22.74	1.93	67.98	7.35	90.72	9.28

Table 2 gives a glimpse of area and gender discrepancies in motorized mode use in Indian states. Amongst all the 'other workers' in the country, those in Maharashtra are major users of motorized modes, while those in Sikkim are the least. One observation worth noting from this table is that men account for more than 90 per cent of the total motorized mode use in the country and in no Indian state does the use of motorized modes exceed for women as compared to men. The same states which displayed maximum and minimum motorized use in the country are the ones that depict greatest and smallest gender gap in it. Figures from NCT of Delhi describe it to be the maximum user of motorized modes among all the union territories of the country.

Figure 4: Gender gap in motorized mode use in rural India. Source: Author's own calculation of Census of India (2011g) data.
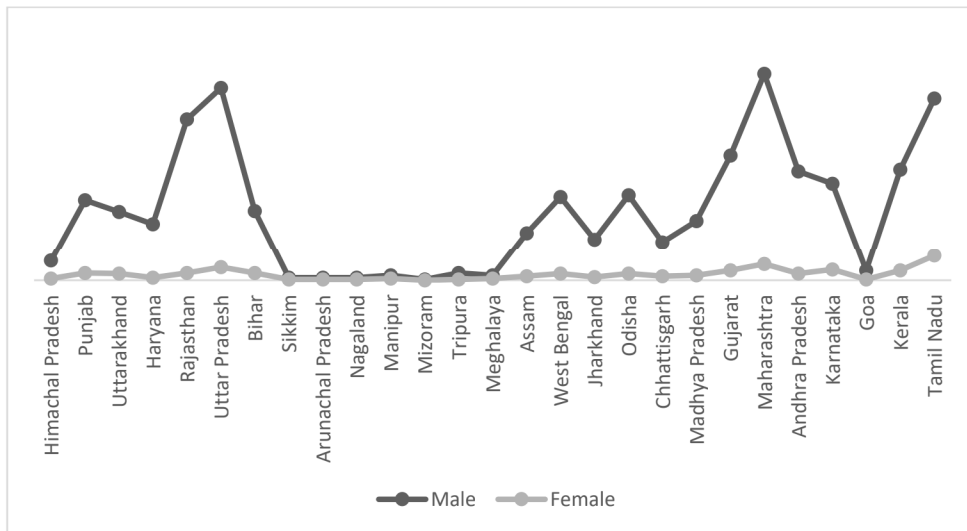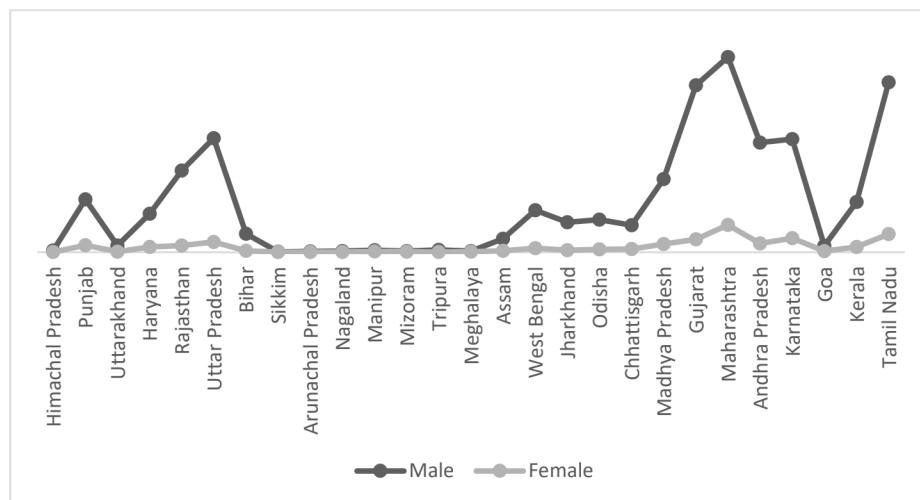
Figure 5: Gender gap in motorized mode use in urban India. Source: Author's own calculation of Census of India (2011g) data.

Figures 4 and 5 aim to highlight the gender disparities in motorized transport use in rural and urban areas of Indian states, respectively. Maharashtra depicts the widest gap irrespective of the area while Mizoram shows the narrowest in rural area and Sikkim the narrowest in urban area.

Table 3: Distance travelled by majority of the workers in the state differentiated by gender and area. Source: Author's own calculation of Census of India (2011g) data.

State	Rural		Urban		Total	
	Male	**Female**	**Male**	**Female**	**Male**	**Female**
Himachal Pradesh	Short	Short	Short	Short	Short	Short
Punjab	Otherwise	Short	Short	Short	Short	Short
Uttarakhand	Short	Short	Short	Short	Short	Short
Haryana	Otherwise	Short	Short	Short	Short	Short
Rajasthan	Otherwise	Short	Short	Short	Short	Short
Uttar Pradesh	Otherwise	Short	Short	Short	Short	Short
Bihar	Short	Short	Short	Short	Short	Short
Sikkim	Short	Short	Short	Short	Short	Short
Arunachal Pradesh	Short	Short	Short	Short	Short	Short

Nagaland	Short	Short	Short	Short	Short	Short
Manipur	Short	Short	Short	Short	Short	Short
Mizoram	Short	Short	Short	Short	Short	Short
Tripura	Short	Short	Short	Short	Short	Short
Meghalaya	Short	Short	Short	Short	Short	Short
Assam	Short	Short	Short	Short	Short	Short
West Bengal	Otherwise	Short	Short	Short	Short	Short
Jharkhand	Short	Short	Short	Short	Short	Short
Odisha	Short	Short	Short	Short	Short	Short
Chhattisgarh	Short	Short	Short	Short	Short	Short
Madhya Pradesh	Short	Short	Short	Short	Short	Short
Gujarat	Otherwise	Short	Short	Short	Short	Short
Maharashtra	Otherwise	Short	Short	Short	Short	Short
Andhra Pradesh	Otherwise	Short	Short	Short	Short	Short
Karnataka	Otherwise	Short	Short	Short	Short	Short
Goa	Otherwise	Otherwise	Short	Short	Otherwise	Short
Kerala	Short	Short	Short	Short	Short	Short
Tamil Nadu	Otherwise	Short	Short	Short	Otherwise	Short
Union Territories						
Andaman & Nicobar Islands	Short	Short	Short	Short	Short	Short
Chandigarh	Short	Short	Short	Short	Short	Short
Dadra & Nagar Haveli	Short	Short	Short	Short	Short	Short
Daman & Diu	Short	Short	Short	Short	Short	Short
NCT of Delhi	Otherwise	Short	Otherwise	Short	Otherwise	Short
Jammu & Kashmir	Otherwise	Short	Short	Short	Otherwise	Short
Lakshadweep	Short	Short	Short	Short	Short	Short
Puducherry	Otherwise	Short	Short	Short	Short	Short
India	Otherwise	Short	Short	Short	Short	Short

Table 3 studies the other important measure of travel behavior, i.e., distance travelled. This table divides distance travelled into two categories of short distance and otherwise where short distance represents a distance of 5 km or less. Any distance above this is considered in the 'otherwise' category. Majority of the individuals in all the states of India travel short distances irrespective of their gender or area of residence. It is only rural female of Goa who travel further distances among all the women in the study area. Men in rural areas of Punjab, Haryana, Rajasthan, Uttar Pradesh, West Bengal, Gujarat, Maharashtra, Andhra Pradesh, Karnataka, Goa and Tamil Nadu, i.e., approximately 40 per cent of the states studied. In urban areas of all the states, both men and women majorly travel short distances. Amongst the union territories, only male workers from NCT of Delhi and Jammu and Kashmir travel longer distances.

Table 4: Percentage of efficient travel behavior displayed by Indian states, segregated by area and gender. Source: Author's own calculation of Census of India (2011g) data.

State	Rural		Urban		Total		Regional total
	Male	**Female**	**Male**	**Female**	**Male**	**Female**	
Himachal Pradesh	50.29	45.91	47.48	49.60	49.75	46.64	51.01
Punjab	32.88	22.88	36.43	31.55	34.93	27.15	33.43
Uttarakhand	41.83	37.79	40.32	39.27	41.05	38.45	40.59
Haryana	39.96	23.01	41.06	36.64	40.58	29.95	38.62
Rajasthan	42.65	37.64	39.26	37.73	40.98	37.67	40.23
Uttar Pradesh	30.92	17.90	35.61	23.01	33.32	19.80	30.52
Bihar	35.53	20.35	40.88	27.10	37.34	21.88	34.10
Sikkim	36.38	43.13	37.58	35.60	36.84	40.26	37.79
Arunachal Pradesh	36.10	40.88	40.56	47.05	38.15	43.48	39.60
Nagaland	33.83	31.35	40.90	36.82	37.50	34.03	36.47
Manipur	29.05	26.72	31.13	25.84	29.97	26.31	28.72
Mizoram	44.40	43.03	40.25	39.79	41.07	40.33	40.81
Tripura	51.65	55.85	52.83	51.14	52.16	54.23	52.67
Meghalaya	39.75	36.96	39.71	38.31	39.73	37.49	38.96

Assam	50.69	48.29	49.22	37.39	50.27	46.25	49.21
West Bengal	48.79	40.52	52.34	41.52	50.78	41.02	48.86
Jharkhand	44.50	40.44	43.32	44.27	43.91	41.86	43.53
Odisha	41.03	43.25	40.84	44.69	40.96	43.67	41.56
Chhattisgarh	36.45	49.06	44.32	54.83	41.33	52.23	43.75
Madhya Pradesh	36.03	33.14	41.92	41.22	40.04	37.67	39.53
Gujarat	35.06	23.42	37.15	34.59	36.61	29.14	35.23
Maharashtra	33.87	29.39	45.96	45.18	43.25	41.08	42.80
Andhra Pradesh	37.45	32.85	35.77	35.40	36.43	34.31	35.92
Karnataka	42.31	37.27	39.02	42.70	40.18	40.43	40.25
Goa	35.42	46.98	30.19	37.28	31.89	40.32	34.04
Kerala	48.06	51.26	43.65	48.22	45.73	49.79	46.80
Tamil Nadu	46.18	46.52	42.60	47.25	43.76	46.99	44.56
Union Territories							
Andaman & Nicobar Islands	48.88	53.17	33.12	32.16	41.86	43.53	42.19
Chandigarh	41.48	42.71	32.33	33.37	32.61	33.56	32.79
Dadra & Nagar Haveli	61.15	54.51	54.29	40.33	56.72	46.75	55.37
Daman & Diu	52.68	62.57	73.29	61.12	69.84	61.49	68.97
NCT of Delhi	56.52	56.37	45.16	44.97	45.39	45.16	45.36
Jammu & Kashmir	40.79	30.60	29.84	30.55	35.74	30.58	34.80
Lakshadweep	72.03	76.72	53.95	68.44	58.43	70.44	60.58
Puducherry	41.37	54.72	32.11	46.40	34.18	48.09	37.32
India	40.12	34.35	41.65	40.39	41.03	37.42	40.24

Table 4 investigates efficient travel behavior of Indian states. Efficient travel behavior, as explained above, is that bundle of travel choice made by 'other workers' where they choose walking and cycling for short distances and public transport for long distances. Tripura, Himanchal Pradesh, Assam, West Bengal and Kerala are the top five states displaying efficient

travel behavior and Manipur, Uttar Pradesh, Punjab, Goa and Bihar are the bottom five states displaying the same. Tripura is that which displays highest efficient behavior in both rural and urban area. Uttar Pradesh in rural area and Manipur in urban area are the two states with least efficient behavior. Tripura state has the highest number of both men and women displaying the desired behavior. While Manipur has the least number of men depicting the same, Uttar Pradesh has the least number of women in this category.

Figure 6: Gender gap in efficient travel behavior in rural India. Source: Author's own calculation of Census of India (2011g) data.
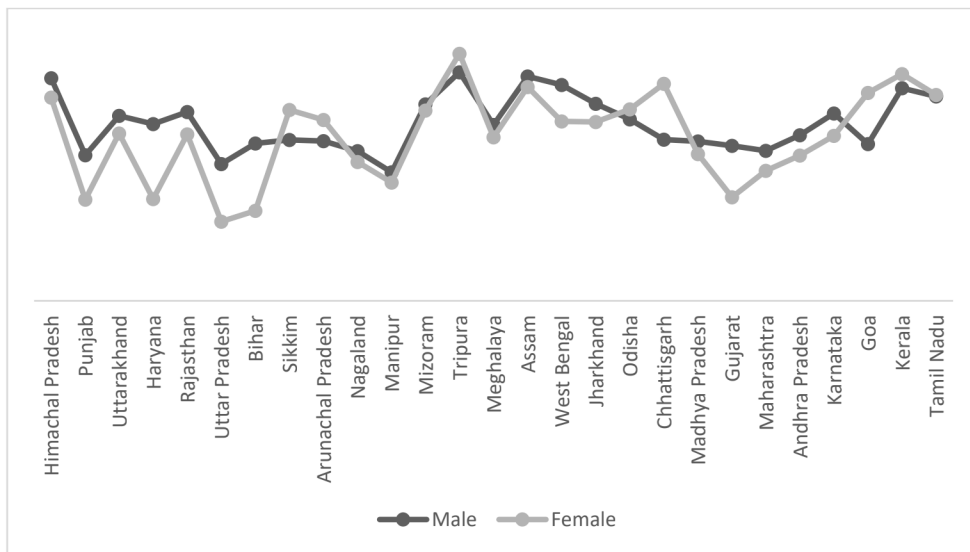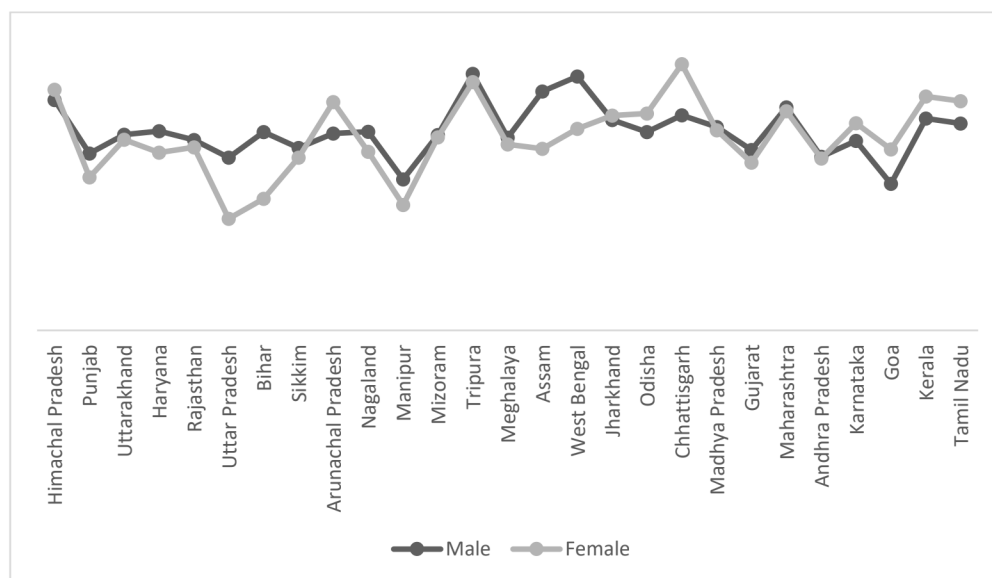
Figure 7: Gender gap in efficient travel behavior in urban India. Source: Author's own calculation of Census of India (2011g) data.

Figures 6 and 7 graphically represent the gender gap in efficient travel behavior of rural and urban areas of Indian states. We observe that Haryana is that state where efficient travel behavior in rural of men exceeds that of women by the highest number and Chhattisgarh is the state where women surpass men in this category. Similarly in the urban area, efficient travel behavior of men exceeds that of women in Bihar while that of women exceeds that of men in Chhattisgarh state.

Table 5: Socio-demographic differences in the selected states.

Characteristic	Kerala	Uttar Pradesh
Population (national share %) [a]	2.76	16.51
Population density [a]	859/km^2	828/km^2
Sex ratio (per 1000 male) [a]	1084	912
NSDP per capita (nominal) (INR)[b]	32,002	97,912

89

HDI (2010) [d]	0.535	0.714
Literacy rate (%) [a]	93.91	69.72
Gross Enrollment Ratio (%) [e]	96.20	109.50
Rural population (% of total) [a]	52.30	77.73
Infant mortality rate (per 1000 live births) [c]	12	57
Unemployment rate (%) [g]	6.1	1.5
Poverty rate (based on MRP consumption, %) [c]	7.05	29.43
Motorized transport use (%) [f]	4.06	8.28
Efficient travel behavior (%) [f]	46.80	30.52
Gender gap in efficient travel behavior (% in favour of female) [f]	4.06	-13.52

[a] **Census of India, 2011**

[b] **MOSPI State Domestic Product, Ministry of Statistics and Programme Implementation, Government of India**

[c] **Handbook of Statistics on Indian States, Reserve Bank of India**

[d] **Sub-national HDI - Area Database - Global Data Lab**

[e] **Statistics of School Education- 2010–11, Ministry of HRD, Government of India.**

[f] **Author's own calculation**

[g] **National Sample Survey Office's (NSSO's) annual periodic labor force survey, 2011-12**

Taking into consideration the analysis of tables 1-4 and figures 2-7, along with a study of important demographic and socio-demographic differences between states mentioned in table 5, we select two states which facilitate noticeable comparisons in not only efficient travel behavior but also factors influencing such behavior. Table 5 aims to highlight these sociodemographic disparities in the selected states of Uttar Pradesh and Kerala.

Figure 8: Display of efficient travel behavior by the districts of the selected states. Source: Author's own calculation of Census of India (2011g) data.

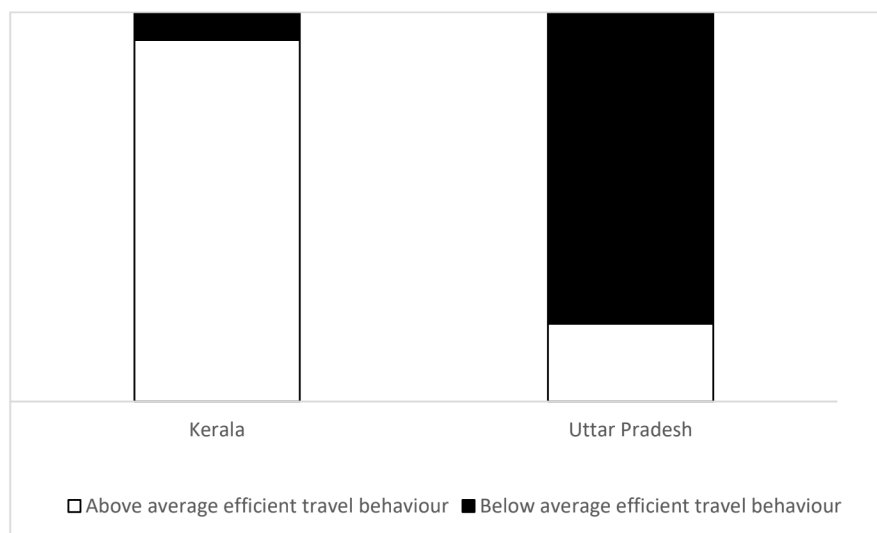☐ Above average efficient travel behaviour ■ Below average efficient travel behaviour

Figure 8 displays efficient travel behavior by the districts of the selected states. We observe how most of the districts in Kerala exhibit above average efficient travel behavior while only one-fourth of the districts in Uttar Pradesh exhibit the same.

Correlations between variables

Table 6 of our analysis aims to understand the interrelationship between the different variables employed in our study. Pairwise correlation coefficients along with their corresponding level of significance were calculated. Efficient travel behavior is significantly positively correlated with GDVA per capita, proportion of currently married individuals in total population, proportion of working age individuals in total, share of female population in total and population density. It is, however, significantly negatively correlated with share of less educated individuals in total and proportion of rural population. GDVA per capita showcases a significant positive correlation with married population share, working age share and female population share. It is negatively correlated with less educated population and rural population

share. Married population's share in total population depicts a significant positive correlation with working age share and female share and a significant negative correlation with less educated and rural population's share. Working age population's share in total population is negatively correlated with less educated and rural population's share in total. It is positively correlated with female in total population. Less educated populations' share is negatively correlated with female population share and population density while positively correlated with share of rural population. Share of rural population in total is negatively correlated with share of female population and population density.

Table 6: Pairwise correlation coefficients between the variables. Author's own calculation based on Census data of 2011.

	Efficient travel behavior	GDVA pc	Married in total	Working age in total	Less educated in total	Rural population in total	Females in total
Efficient travel behavior							
GDVA pc	0.608***						
Married in total	0.649***	0.659***					
Working age in total	0.804***	0.723***	0.847***				
Less educated in total	-0.765***	-0.693***	-0.788***	-0.881***			
Rural population in total	-0.765***	-0.591***	-0.377***	-0.639***	0.641***		
Females in total	0.648***	0.401***	0.684***	0.613***	-0.626***	-0.200*	
Population density	0.359**	0.106	0.002	0.134	-0.312**	-0.543***	0.071

*** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$.

Beta regression model of efficient travel behavior

Table 7 shows the results of the beta regression model for impact of socio-demographic factors on efficient travel behavior of 'other workers' for the two selected states. On the basis of the observations from table 6 and larger than acceptable values of Variance Inflation Factor (VIF) measure of certain variables, proportion of working age individuals in total population is dropped from the analysis depicted in table 7, to avoid the problem of multicollinearity. Dummy variable for state takes a value of 1 if the state is Kerala and of 0 if it is UP. We find that if the 'other workers' are from Kerala, efficient travel behavior will go up by 1.5 per cent. The variable for share of currently married individuals in total populations also depicts significant results. This finding is in accordance with the findings of the study conducted on a dataset in Pakistan by Adeel, Yeh and Zhang (2017). The model finds that if the share of married individuals will increase in total population, efficient travel behavior of workers will decline by about 4.4 per cent. Proportion of less educated individuals in total population also gives significant results. With an increase in the proportion of less educated individuals in total population, the efficient travel behavior is found to fall by about 3.1%. Another significant result is of share of rural population in total. The findings of the model observe that an increase in share of rural population in total population by one per cent brings about a decrease in efficient travel behavior of workers by 2.6 per cent. Population density of a district is also found to significantly impact the travel behavior choices of individuals. A rise in population density of the region by a per cent is noticed to bring about a rise in efficient travel behavior by 0.6 per cent. This finding is not in accordance with the findings of (Goel and Mohan, 2020).

Factors such as GDVA per capita of the district and share of less educated individuals in total population are expected to have a negative impact on increase in travel behavior with their simultaneous increase whereas a rise in share of working age individuals in total population

and share of women in total population is expected to simultaneously increase efficient travel behavior.

Table 7: Beta regression results for factors affecting efficient travel behavior. Author's own calculation based on Census data of 2011.

Independent variables	Coefficient	Marginal effects
State (ref: Uttar Pradesh)	1.290***	0.015***
	(0.271)	(0.003)
GDVA per capita	-0.000	-0.002
	(0.000)	(0.002)
Share of currently married individuals in total population	-3.823*	-0.044*
	(2.026)	(0.023)
Share of less educated individuals in total population	-1.822*	-0.031*
	(0.950)	(0.016)
Share of rural population in total	-1.800***	-0.026***
	(0.283)	(0.004)
Share of females in total population	-0.626	-0.007
	(3.996)	(0.048)
Population density	0.000***	0.006***
	(0.000)	(0.002)
Constant	0.463	
	(2.398)	
	5.927***	
	(0.161)	

Log likelihood	287.087
Chi-Square	149.10
Observations	79

*** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$. Standard errors in parenthesis.

4.2.1.2 Part-II

(I) Descriptive Statistics

(I) (a) General regional and commuting characteristics

Table 8 shows the general characteristics such as population density, area, distribution of total employment between male and female of the selected districts of UP. It depicts that the percentage of male employed is approximately five times the percentage of female employed, on average, in both rural and urban areas of all the districts studied. The highest difference between the percentage of male employed and the percentage of female employed is in rural Meerut and the lowest difference in rural Allahabad. The highest population density in the urban area among the eight districts studied is in Varanasi and the lowest in Jhansi. In the rural area, the highest is in Ghaziabad as against the lowest in Jhansi.

Table 8: Characteristics of the 8 districts studied. Author's own calculation based on Census data of 2011.

City	Region	Area in sq. km	Population density	Total employment (main workers), thousand	Total male employment (main workers), thousand	Total female employment (main workers), thousand	Share of total employment, Male, %	Share of total employment, Female, %
Agra	Total	4041	1093.49	1050562	912621	137941	86.87	13.13
Agra	Rural	3793.04	631.31	545001	478783	66218	87.85	12.15
Agra	Urban	247.96	8163.39	505561	433838	71723	85.81	14.19
Allahabad	Total	5482	1086.17	1286732	981133	305599	76.25	23.75
Allahabad	Rural	5279.07	848.92	934718	691121	243597	73.94	26.06
Allahabad	Urban	202.93	7258.04	352014	290012	62002	82.39	17.61
Ghaziabad	Total	1179	3970.86	1252911	1071029	181882	85.48	14.52
Ghaziabad	Rural	777.91	1952.79	385408	326150	59258	84.62	15.38
Ghaziabad	Urban	401.09	7884.88	867503	744879	122624	85.86	14.14
Jhansi	Total	5024	397.81	560041	443645	116396	79.22	20.78
Jhansi	Rural	4744.05	245.60	345377	260649	84728	75.47	24.53
Jhansi	Urban	279.95	2977.26	214664	182996	31668	85.25	14.75
Kanpur	Total	3155	1452.07	1229166	1067154	162012	86.82	13.18
Kanpur	Rural	2832.16	552.80	412665	352104	60561	85.32	14.68
Kanpur	Urban	322.84	9341	816501	715050	101451	87.57	12.425
Lucknow	Total	2528	1815.60	1152285	969574	182711	84.14	15.86
Lucknow	Rural	2057.29	753.83	336353	281170	55183	83.59	16.41
Lucknow	Urban	470.71	6456.20	815932	688404	127528	84.37	15.63
Meerut	Total	2559	1345.72	890810	775053	115757	87.01	13
Meerut	Rural	2300.83	732.13	429083	369254	59829	86.06	13.94
Meerut	Urban	258.17	6814.05	461727	405799	55928	87.89	12.11
Varanasi	Total	1535	2395.34	920761	750828	169933	81.54	18.46
Varanasi	Rural	1371.22	1516.74	481833	380640	101193	79	21.00
Varanasi	Urban	163.78	9751.20	438928	370188	68740	84.34	15.66

Table 9 presents the share of commuters among 'other main workers' or non-agricultural workers and among all workers, segregated by gender, area, and region. The share of regularly commuting non-agricultural workers is greater in urban areas as compared to the rural areas. The lowest difference between areas and genders is observable in Allahabad. In all the districts studied, a higher percentage of women commute to non-agricultural jobs as against the corresponding percentage of men. The table also indicates that the share of commuting non-agricultural workers in the total working population is quite low in rural districts where agricultural activities are the most prominent. Particularly, the share of women commuting to non-agricultural jobs can be as low as 11.4 per cent, e.g., in rural Jhansi.

Table 9: Share of commuters (%) among non-agricultural workers and among all workers, differentiated by district, area and gender. Author's own calculation based on Census data of 2011.

City	Region	Percentage of commuters among non-agricultural workers, Total	Percentage of commuters among non-agricultural workers, Male	Percentage of commuters among non-agricultural workers, Female	Percentage of commuting non-agricultural workers among all workers	Percentage of commuting non-agricultural workers among all workers, Male	Percentage of commuting non-agricultural workers among all workers, Female
Agra	Total	70.19	73.58	58.51	55.81	56.29	53.84
Agra	Rural	67.78	71.77	55.62	30.10	29.89	30.95
Agra	Urban	71.22	74.32	59.91	85.13	86.17	80.73
Allahabad	Total	68.62	71.78	60.07	43.12	48.80	31.30
Allahabad	Rural	67.84	71.44	58.95	30.47	35.22	21.72
Allahabad	Urban	69.58	72.16	61.66	84.82	86.69	78.70
Ghaziabad	Total	77.14	80.54	64.67	75.92	76.87	71.83
Ghaziabad	Rural	70.60	75.26	57.24	48.11	48.54	46.57
Ghaziabad	Urban	79.04	81.97	67.45	89.38	89.94	86.75
Jhansi	Total	70.09	72.83	61.24	35.50	40.61	23.93
Jhansi	Rural	65.56	69	58.71	13.80	15.18	11.37
Jhansi	Urban	71.76	74	62.79	75.54	77.99	65.80
Kanpur	Total	76.97	79.18	66.68	66.54	68.12	59.02
Kanpur	Rural	72.36	75.57	61.55	23.39	23.89	21.54
Kanpur	Urban	77.68	79.70	67.75	90.60	91.06	88.05
Lucknow	Total	75.47	78.07	66.26	68.99	69.97	65.18
Lucknow	Rural	71.98	75.43	60.71	30.99	31.96	27.59
Lucknow	Urban	76.12	78.56	67.39	88.43	88.79	86.95
Meerut	Total	71.78	74.62	60.21	62.11	62.88	58.51
Meerut	Rural	67.44	71.26	55.79	39.03	38.78	40.05
Meerut	Urban	73.94	76.15	63.37	85.04	85.51	82.42
Varanasi	Total	72.74	75.43	62.17	55.04	60.27	38.93
Varanasi	Rural	74.39	77.79	61.82	41.53	47.88	25.69
Varanasi	Urban	71.54	73.75	62.44	72.92	74.76	65.13

(I) (b) Travel modes

Table 10 displays travel-mode shares for home-to-work commuting between urban and rural areas, between men and women and among the eight districts of Uttar Pradesh. Non-motorized modes of transport are the most environment- friendly modes, followed by public transport modes such as buses and trains. Therefore, we first indicate the share of non-motorized trips in total commuting trips. While 56.5 per cent of all trips on an average are undertaken using these slow travel modes (walking and cycling) in all the districts, public transport modes (buses and trains) are used for only 10.3 per cent of the trips. The total share of individual motorized modes (four- and two-wheelers) is averaged around 32 per cent.

Table 10: Modal use by district, area and gender (% of total commuting trips). Author's own calculation of Census of India (2011g) data

City	Mode	Urban		Rural		Total
		Male	Female	Male	Female	
Agra	On foot	18.86	14.35	10.92	13.52	16.15
Agra	Bicycle	18.98	4.59	24.08	2.45	17.32
Agra	Moped/Scooter/Motor Cycle	17.23	5.88	8.22	1.33	12.77
Agra	Car/Jeep/Van	1.92	1.46	0.88	0.29	1.53
Agra	Tempo/Autorickshaw/Taxi	4.73	4.09	3.66	0.81	4.17
Agra	Bus	2.12	1.95	8.28	1.31	3.46
Agra	Train	1.29	0.53	3.92	0.39	1.74
Agra	Water transport	0.05	0.04	0.04	0.04	0.05
Agra	Any other	0.28	0.19	0.64	0.07	0.34
Agra	All Modes	100	100	100	100	100
Allahabad	On foot	13.26	14.62	13.44	22.36	14.70
Allahabad	Bicycle	17.15	4.39	25.24	3.60	17.32
Allahabad	Moped/Scooter/Motor Cycle	21.53	6.90	7.62	1.25	11.67
Allahabad	Car/Jeep/Van	2.54	2.18	0.95	0.37	1.56

Allahabad	Tempo/Autorickshaw/Taxi	2.07	5.29	3.01	1.04	2.63
Allahabad	Bus	2.02	2.90	3.97	0.90	2.75
Allahabad	Train	2.25	1.07	5.21	0.72	3.12
Allahabad	Water transport	0.06	0.03	0.12	0.04	0.08
Allahabad	Any other	0.53	0.44	0.46	0.09	0.44
Allahabad	All Modes	100	100	100	100	100
Ghaziabad	On foot	18.67	17.55	13.09	17.50	17.55
Ghaziabad	Bicycle	16.29	3.06	21.27	1.84	14.67
Ghaziabad	Moped/Scooter/Motor Cycle	15.41	4.50	9.11	1.04	12.27
Ghaziabad	Car/Jeep/Van	7.30	7.16	1.31	0.30	6
Ghaziabad	Tempo/Autorickshaw/Taxi	4.73	6.80	4.60	1.37	4.85
Ghaziabad	Bus	9.40	9.10	12.77	2.36	9.60
Ghaziabad	Train	5.28	2.86	3.44	0.54	4.44
Ghaziabad	Water transport	0.08	0.07	0.07	0.06	0.08
Ghaziabad	Any other	0.84	0.63	1.45	0.28	0.89
Ghaziabad	All Modes	100	100	100	100	100
Jhansi	On foot	21.30	19.98	19.03	22.80	20.84
Jhansi	Bicycle	15.17	2.87	15.72	1.96	12.66
Jhansi	Moped/Scooter/Motor Cycle	18.91	6.28	8.23	1.09	14.02
Jhansi	Car/Jeep/Van	1.35	0.95	0.52	0.20	1.06
Jhansi	Tempo/Autorickshaw/Taxi	3.81	6.82	3.37	1.42	3.94
Jhansi	Bus	1.95	2.50	4.83	1.31	2.48
Jhansi	Train	1.95	1.16	2.77	0.79	1.90
Jhansi	Water transport	0.03	0.06	0.03	0.01	0.04
Jhansi	Any other	0.41	0.13	0.57	0.088	0.37
Jhansi	All Modes	100	100	100	100	100
Kanpur	On foot	20.46	21.56	14.52	25.89	20.13
Kanpur	Bicycle	24.27	5.75	29.48	4.25	21.92
Kanpur	Moped/Scooter/Motor Cycle	18.71	6.72	6.85	1.34	15.53

Kanpur	Car/Jeep/Van	2.24	2.92	0.73	0.36	2.13
Kanpur	Tempo/Autorickshaw/Taxi	4.89	10.56	6.18	3.17	5.71
Kanpur	Bus	1.32	2.62	4.03	1.43	1.77
Kanpur	Train	2.09	1.82	4.91	0.89	2.31
Kanpur	Water transport	0.05	0.07	0.02	0.05	0.05
Kanpur	Any other	0.50	0.38	0.94	0.15	0.52
Kanpur	All Modes	100	100	100	100	100
Lucknow	On foot	14.11	15.76	12.69	21.16	14.42
Lucknow	Bicycle	19.82	4.36	30.89	5.02	18.19
Lucknow	Moped/Scooter/Motor Cycle	25.07	10.10	11.45	2.83	20.29
Lucknow	Car/Jeep/Van	4.06	4.13	1.06	0.62	3.60
Lucknow	Tempo/Autorickshaw/Taxi	4.07	10.71	3.01	2.48	4.98
Lucknow	Bus	2.23	4.15	3.52	1.86	2.69
Lucknow	Train	2.82	1.92	4.14	1.22	2.78
Lucknow	Water transport	0.07	0.05	0.05	0.02	0.06
Lucknow	Any other	0.48	0.42	0.62	0.09	0.47
Lucknow	All Modes	100	100	100	100	100
Meerut	On foot	17.33	15.53	10.54	13.41	15.20
Meerut	Bicycle	21.77	3.82	22.14	1.74	18.75
Meerut	Moped/Scooter/Motor Cycle	16.47	6.59	6.32	0.70	11.93
Meerut	Car/Jeep/Van	2.51	2.64	0.87	0.24	1.97
Meerut	Tempo/Autorickshaw/Taxi	2.20	4.68	4.23	1.40	2.90
Meerut	Bus	5.18	7.27	11.86	2.43	6.88
Meerut	Train	1.74	0.92	2.14	0.39	1.67
Meerut	Water transport	0.06	0.06	0.05	0.03	0.06
Meerut	Any other	1.43	0.67	1.53	0.44	1.31
Meerut	All Modes	100	100	100	100	100
Varanasi	On foot	17.25	19.09	12.32	27.20	16.44
Varanasi	Bicycle	22.24	4.311	39.15	4.47	25.12

Varanasi	Moped/Scooter/Motor Cycle	17.97	6.28	9.02	1.87	12.44
Varanasi	Car/Jeep/Van	1.51	1.57	1.10	0.48	1.29
Varanasi	Tempo/Autorickshaw/Taxi	2.11	5.54	1.87	1.62	2.32
Varanasi	Bus	1.16	1.99	4.09	1.78	2.32
Varanasi	Train	1.65	0.85	3.25	0.65	2.06
Varanasi	Water transport	0.05	0.06	0.05	0.02	0.05
Varanasi	Any other	0.47	0.17	0.60	0.14	0.47
Varanasi	All Modes	100	100	100	100	100

The differences between areas and genders are more pronounced. 69 per cent of the commuting by women in rural areas is undertaken on foot as against 40 per cent of the women in urban areas using the same. In urban areas, the use of scooters and taxis by women increases. In rural areas, the bicycle is the most frequently used travel mode for male commuters, followed by walking with considerable differences in the two values. The share of urban men commuting on foot is somewhat higher than the share of rural men. Commuting by bicycle and mopeds are equally and highly frequent in urban areas.

Only a small fraction (1 per cent) of the rural residents uses a car for commuting purposes. In the urban areas, the proportion of women using a private car for commuting is more than men.

(I) (c) Commuting distances

Table 11 gives details of the shares of commuter trips over different distances segregated by gender and area for the chosen districts. More than fifty percent of all the trips are short trips of less than 5 km. Long trips of more than 20 km make up 13.5 per cent of all trips. Again, type of area and gender bring about some differences in these trip length shares. Rural men are more likely to undertake long commuter trips than urban men. It is mostly the men in rural areas who

undertake trips longer than 50 km. Male commuters in both rural and urban areas cover longer

distances than their female counterparts. They also cover most of their trips on foot.

Table 11: Commuting trip lengths (% of total commuting trips) by district, area and gender. Author's own calculation of Census of India (2011g) data

City	Distance Class	Urban		Rural		Total
		Male	Female	Male	Female	
Agra	0-1 km	20.15	26.58	12.73	40.61	19.28
Agra	2-5 km	34.60	31.77	19.11	19.45	30.33
Agra	6-10 km	26.71	27.67	20.71	26.39	25.33
Agra	11-20 km	7.05	5.53	21.32	5.78	10.35
Agra	21-30 km	8.98	5.59	17.39	5.22	10.67
Agra	31-50 km	1.27	1.52	4.30	1.21	2.02
Agra	51+ km	1.24	1.34	4.45	1.34	2.02
Agra	All lengths	100	100	100	100	100
Agra	Share in total trips	66.31	7.44	24.10	2.14	100
Allahabad	0-1 km	17.45	23.25	16.91	42.42	19.65
Allahabad	2-5 km	34.36	31.50	24.87	23.39	28.91
Allahabad	6-10 km	26.38	28.37	20.48	23.97	23.61
Allahabad	11-20 km	7.69	6.59	13.95	3.36	10.13
Allahabad	21-30 km	10.33	6.14	14.75	4.50	11.60
Allahabad	31-50 km	1.89	2.35	4.82	1.29	3.21
Allahabad	51+ km	1.90	1.79	4.22	1.06	2.89
Allahabad	All lengths	100	100	100	100	100
Allahabad	Share in total trips	39.20	6.71	45.86	8.23	100
Ghaziabad	0-1 km	17.32	22.94	14.17	44.61	17.82
Ghaziabad	2-5 km	27.42	26.16	23.41	20.58	26.53
Ghaziabad	6-10 km	21.22	23.31	23.30	22.68	21.79
Ghaziabad	11-20 km	14.82	13.44	14.08	4.12	14.38
Ghaziabad	21-30 km	12.17	8.38	11.71	3.78	11.59
Ghaziabad	31-50 km	5	4.21	8.27	2.64	5.41

Ghaziabad	51+ km	2.05	1.56	5.07	1.60	2.48
Ghaziabad	All lengths	100	100	100	100	100
Ghaziabad	Share in total trips	72.31	9.82	16.21	1.66	100
Jhansi	0-1 km	24.39	28.96	23.64	42.04	25.39
Jhansi	2-5 km	46.75	42.01	28.82	31.64	42.62
Jhansi	6-10 km	17.39	17.41	20.95	18.08	18.03
Jhansi	11-20 km	4.23	4.61	10.79	2.98	5.34
Jhansi	21-30 km	3.39	2.96	5.52	1.6	3.64
Jhansi	31-50 km	0.96	1.31	2.99	0.78	1.33
Jhansi	51+ km	2.90	2.74	7.29	2.87	3.64
Jhansi	All lengths	100	100	100	100	100
Jhansi	Share in total trips	69.54	9.28	17.19	3.99	100
Kanpur	0-1 km	19.35	25.90	16.17	47.52	20.03
Kanpur	2-5 km	37.78	35.84	23.68	26.46	36.06
Kanpur	6-10 km	26.19	22.25	20.21	14.52	25.07
Kanpur	11-20 km	9.57	7.51	17.31	4.49	10.06
Kanpur	21-30 km	3.44	3.20	10.11	3.15	4.07
Kanpur	31-50 km	1.28	1.99	6.11	2.09	1.83
Kanpur	51+ km	2.40	3.31	6.41	1.77	2.88
Kanpur	All lengths	100	100	100	100	100
Kanpur	Share in total trips	79.22	9.63	9.83	1.32	100
Lucknow	0-1 km	15.40	21.25	14.81	34.623	16.36
Lucknow	2-5 km	32.84	32.63	20.83	24.55	31.17
Lucknow	6-10 km	28.09	26.38	19.15	23.31	26.68
Lucknow	11-20 km	13.10	10.78	19.83	7.10	13.56
Lucknow	21-30 km	6.64	4.12	17.71	6.40	7.71
Lucknow	31-50 km	1.35	1.92	5.73	2.60	1.99
Lucknow	51+ km	2.59	2.92	1.94	1.41	2.53
Lucknow	All lengths	100	100	100	100	100
Lucknow	Share in total trips	73.45	12.40	12.51	1.63	100

Meerut	0-1 km	21.86	26.49	13.87	41.68	20.66
Meerut	2-5 km	38.53	34.73	20.80	22.34	33.55
Meerut	6-10 km	21.35	21.27	22.92	21.74	21.74
Meerut	11-20 km	6.46	6.32	21.84	6.68	10.24
Meerut	21-30 km	5.28	3.71	9.86	3.34	6.25
Meerut	31-50 km	2.13	2.14	4.20	1.74	2.63
Meerut	51+ km	4.38	5.35	6.50	2.48	4.93
Meerut	All lengths	100	100	100	100	100
Meerut	Share in total trips	66.18	7	24.60	2.21	100
Varanasi	0-1 km	21.22	29.62	13.75	42.05	19.69
Varanasi	2-5 km	39.85	35.09	23.94	28.63	32.56
Varanasi	6-10 km	23.42	24.40	23.68	19.49	23.40
Varanasi	11-20 km	6.47	4.27	20.83	4.46	12.07
Varanasi	21-30 km	5.45	3.52	12.48	3.16	8.08
Varanasi	31-50 km	1.30	1.30	2.42	1.08	1.74
Varanasi	51+ km	2.30	1.80	2.90	1.14	2.46
Varanasi	All lengths	100	100	100	100	100
Varanasi	Share in total trips	48.44	6.18	40.63	4.75	100

Table 12 exhibits the most frequently used travel modes for home-to-work commuting, differentiated by area and district of residence, distance category, and gender. Men in rural and urban areas most often use a bicycle to cover trips between 2 and 5 km. Commuting women in both the areas undertake most trips up to 10 km on foot.

Table 12: Most frequently used mode of commuting, by district, area, distance class and gender. Author's own calculation of Census of India (2011g) data

City	Distance class, km	Urban		Rural	
		Male	Female	Male	Female
Agra	0-1 km	On foot	On foot	On foot	On foot
Agra	2-5 km	Bicycle	On foot	Bicycle	On foot
Agra	6-10 km	On foot	On foot	Bicycle	On foot
Agra	11-20 km	Moped/Scooter/Motor Cycle	Moped/Scooter/Motor Cycle	Bicycle	Bicycle
Agra	21-30 km	Bicycle	Bicycle	Bicycle	Bicycle
Agra	31-50 km	Bus	Bus	Bus	Bus
Agra	51+ km	Train	Bus	Bus	Bus
Allahabad	0-1 km	On foot	On foot	On foot	On foot
Allahabad	2-5 km	Bicycle	On foot	Bicycle	On foot
Allahabad	6-10 km	Moped/Scooter/Motor Cycle	On foot	Bicycle	On foot
Allahabad	11-20 km	Moped/Scooter/Motor Cycle	Moped/Scooter/Motor Cycle	Bicycle	Bicycle
Allahabad	21-30 km	Bicycle	Bicycle	Bicycle	Bicycle
Allahabad	31-50 km	Moped/Scooter/Motor Cycle	Bus	Bus	Bus
Allahabad	51+ km	Train	Bus	Train	Train
Ghaziabad	0-1 km	On foot	On foot	On foot	On foot
Ghaziabad	2-5 km	Bicycle	On foot	Bicycle	On foot
Ghaziabad	6-10 km	On foot	On foot	Bicycle	On foot
Ghaziabad	11-20 km	Moped/Scooter/Motor Cycle	Bus	Bicycle	Bus
Ghaziabad	21-30 km	Bicycle	Bus	Bicycle	Bicycle
Ghaziabad	31-50 km	Bus	Bus	Bus	Bus

Ghaziabad	51+ km	Train	Bus	Bus	Bus
Jhansi	0-1 km	On foot	On foot	On foot	On foot
Jhansi	2-5 km	Moped/Scooter/Motor Cycle	On foot	Bicycle	On foot
Jhansi	6-10 km	Moped/Scooter/Motor Cycle	On foot	Bicycle	On foot
Jhansi	11-20 km	Moped/Scooter/Motor Cycle	Tempo/Autorickshaw/Taxi	Bicycle	Bus
Jhansi	21-30 km	Bicycle	Bicycle	Bicycle	Bus
Jhansi	31-50 km	Moped/Scooter/Motor Cycle	Bus	Bus	Bus
Jhansi	51+ km	Train	Train	Train	Train
Kanpur	0-1 km	On foot	On foot	On foot	On foot
Kanpur	2-5 km	Bicycle	On foot	Bicycle	On foot
Kanpur	6-10 km	Bicycle	On foot	Bicycle	On foot
Kanpur	11-20 km	Moped/Scooter/Motor Cycle	Moped/Scooter/Motor Cycle	Bicycle	Tempo/Autorickshaw/Taxi
Kanpur	21-30 km	Bicycle	Bicycle	Bicycle	Bicycle
Kanpur	31-50 km	Moped/Scooter/Motor Cycle	Bus	Bus	Bus
Kanpur	51+ km	Train	Train	Train	Train
Lucknow	0-1 km	On foot	On foot	On foot	On foot
Lucknow	2-5 km	Bicycle	On foot	Bicycle	On foot
Lucknow	6-10 km	Moped/Scooter/Motor Cycle	On foot	Bicycle	On foot
Lucknow	11-20 km	Moped/Scooter/Motor Cycle	Moped/Scooter/Motor Cycle	Bicycle	Bicycle
Lucknow	21-30 km	Bicycle	Bicycle	Bicycle	Bicycle
Lucknow	31-50 km	Moped/Scooter/Motor Cycle	Bus	Bus	Bus
Lucknow	51+ km	Train	Train	Train	Train
Meerut	0-1 km	On foot	On foot	On foot	On foot
Meerut	2-5 km	Bicycle	On foot	Bicycle	On foot

Meerut	6-10 km	Bicycle	On foot	Bicycle	On foot
Meerut	11-20 km	Moped/Scooter/Motor Cycle	Bus	Bicycle	Bus
Meerut	21-30 km	Bicycle	Bicycle	Bicycle	Bicycle
Meerut	31-50 km	Bus	Bus	Bus	Bus
Meerut	51+ km	Bus	Bus	Bus	Bus
Varanasi	0-1 km	On foot	On foot	On foot	On foot
Varanasi	2-5 km	Bicycle	On foot	Bicycle	On foot
Varanasi	6-10 km	Bicycle	On foot	Bicycle	On foot
Varanasi	11-20 km	Moped/Scooter/Motor Cycle	Moped/Scooter/Motor Cycle	Bicycle	On foot
Varanasi	21-30 km	Bicycle	Bicycle	Bicycle	Bicycle
Varanasi	31-50 km	Moped/Scooter/Motor Cycle	Bus	Bus	Bus
Varanasi	51+ km	Train	Train	Train	Train

Men in rural areas cover distances between 2 and 30 km on a bicycle, whereas men in urban areas use two-wheeler mopeds for the same distance. Female commuters in urban areas use mopeds as their most frequent mode of travel for distances between 11 and 20 km. Most of the trips above 50 km are undertaken using public transport such as bus and trains in the urban and rural areas of all the districts by both men and women.

(II) Regression results

(II) (a) Travel modes

Table 13 presents the regression results for different shares of travel modes. The dependent variable is the share of various modes of travel. Trains and water transport are not considered in the analysis due to low occurrence in the commuter sector. Dummy variable for urban versus rural area, dummies for different districts and other socio-economic characteristics are used as

108

the explanatory variables. The effect of these variables on travel mode shares is modeled by a simple OLS regression. The results for men and women are presented separately. For better readability, most statistically insignificant coefficients are excluded from the tables.

Table 13: OLS regression results for modal shares of male and female commuters. Author's own calculation based on Census data of 2011

	Male Commuters				Female Commuters			
	NMT	Moped	Car	Bus	NMT	Moped	Car	Bus
Urban Dummy	1.243* (.474)	1.880 (1.755)	1.089 (1.089)	.129 (.614)	-0.672 (1.088)	3.735* (1.482)	4.902 (2.375)	5.413* (2.292)
Minorities share		-0.716* (.299)			-0.745 (.371)			
Unemployment rate	0.971 (0.456)	-0.591 (0.595)	-1.493** (0.456)	-1.304** (0.405)	-0.159 (0.547)		-1.790* (0.738)	-1.794* (0.712)
Population	1.028** (0.208)					1.181** (0.391)		
Population density		-0.110 (0.695)				-0.016 (.530)	-0.884 (0.897)	-1.154 (0.866)
Literacy rate	-0.476 (0.319)		1.103** (0.380)	0.928* (0.337)	-0.561 (0.335)		0.455 (0.298)	0.391 (0.287)
Share of elderly	0.989 (0.575)	0.431 (0.6171)	-0.568 (0.610)	-0.937 (0.542)	-1.768** (0.530)	2.646* (1.106)		
Agra	0.806 (0.883)	1.223 (1.190)	-.0274 (1.130)	-.540 (1.005)	-1.014 (1.072)	3.100* (1.357)	-0.816 (0.829)	-0.852 (0.800)
Allahabad	-2.190* (0.755)	1.308 (0.894)	1.722* (0.769)	1.502* (0.683)	0.8113 (0.623)	-0.385 (0.610)	-0.418 (0.842)	-0.523 (0.813)
Ghaziabad	2.372 (1.248)	1.112 (1.326)	-0.353 (1.343)	-0.158 (1.193)	-1.772 (0.906)	3.421* (1.459)	0.743 (0.818)	0.887 (0.789)

Jhansi	0.535	0.118	-1.273	-1.128	1.966	-1.567	-1.895	-2.206
	(0.580)	(.908)	(0.658)	(0.584)	(1.070)	(1.083)	(1.404)	(1.355)
Kanpur	-0.421	1.602	0.506	0.516	3.138**	-2.112	1.752	1.526
	(0.628)	(0.846)	(0.739)	(0.657)	(0.818)	(1.161)	(0.923)	(0.891)
Lucknow	-0.593	1.982*	1.620*	0.884	2.141*	0.426	1.961*	1.620
	(0.481)	(0.673)	(0.615)	(0.547)	(0.819)	(0.708)	(0.895)	(0.863)
Meerut	1.591	0.189	-0.950	-0.702	-1.696*	2.225	1.961	-0.078
	(0.943)	(1.132)	(1.001)	(0.890)	(0.703)	(1.042)	(0.873)	(0.842)
Constant	-0.884	-1.882	-0.700	-0.111	-0.110	-2.506**	-2.575*	-2.753*
	(0.504)	(1.044)	(0.693)	(0.616)	(0.741)	(0.832)	(1.028)	(0.992)
Adj R²	0.85	0.67	0.68	0.75	0.71	0.76	0.51	0.55
F-stat	8.3	3.55	3.88	5.01	0.14	5.21	2.43	2.64

The results in Table 13 suggest that the dummy for urban areas has a significant positive impact on the share of moped usage by female commuters. In the case of walking and cycling, it is positively related to the trips undertaken by men and negatively to those undertaken by women. This means that on average women are shifting from slow modes to two-wheeler motorized modes of transport in urban areas. These findings are in line with the findings of Korzhenevych and Jain (2018).

The share of minorities is negatively related to the share of moped usage by men. Because this comparatively disadvantaged group of people is usually employed in low-paid local jobs (Korzhenevych and Jain, 2018), in their case, even the ownership of two-wheeled motorized vehicle is low.

High unemployment rates have a significantly negative relationship with the share of people commuting by car. In the case of men, it increases the share of walking and cycling. These cheaper modes enable people to search for jobs in places near to their places of residence. When unemployed and poor, finding jobs in far-off areas and spending much on travel is not the most opted and feasible choice.

Any increase in population will subsequently bring about a significant increase in the number of people, especially men, walking and cycling. Also, with an increase in population, the absolute number of women moped users will significantly increase. This result is congruous with the results presented by Ahmad and Puppim de Oliveira (2016). Population density does not show any significant impact on the travel mode choice of men and women. This is in accordance with the results presented by Korzhenevych and Jain (2018) and Munshi (2016).

A high literacy rate significantly increases the share of car usage by men. Literacy rate is used as a proxy for income. As the literacy rate increases, the share of non-motorized transport usage decreases of both men and women. This variable also has a positive impact on bus usage by both the sexes. It is also interesting to note that a higher rate of literacy strongly increases the share of car usage by men than it does for women. This result is congruous with the results presented by Ahmad and Puppim de Oliveira (2016)

The share of cars used for commuting has a negative relationship with the share of elderly workers. This can be assumed to be congruous with our line of thinking as cars may not be used so much by the elderly people. Share of elderly has a positive impact on the use of buses by men but is not statistically significant.

Coming to the effects connected with specific districts. Kanpur and Lucknow have a positive impact on the use of buses by both men and women. In addition, most of the districts have a negative impact on the share of bus used by men and women.

All the districts have a positive effect on the use of mopeds by men, while the same is only true for the cities of Agra, Ghaziabad, Lucknow, and Meerut in the case of women. Allahabad and Lucknow seem to have a significant positive effect on the usage of cars by men. The cities of Allahabad, Kanpur, and Lucknow have a negative effect on the usage of non-motorized transport by men. Most of the cities appear to have a positive impact on the usage of non-motorized transport by women. Lucknow seems to have a significant positive impact on the share of cars used by women.

In Lucknow, which is the capital of the state, a higher proportion of commuters use mopeds and cars as against a lower share travelling by bus. Kanpur, which is the district with the highest population, has a negative impact on the share of non-motorized transport by men while the effect on the share of non-motorized transport by women is significantly positive. Ghaziabad, which is also a part of the NCR, has a positive impact on the share of car and moped usage by women.

(II) (b) Commuting Distances

Table 14 shows the regression results for different distance categories. The trip lengths, taken as dependent variables, are divided into three categories of short, intermediate, and long. The explanatory variables are the dummy variable for urban versus rural area, dummies for different districts, and socioeconomic characteristics.

Table 14: OLS regression results for distance classes of male and female commuters. Author's own calculation based on Census data of 2011

	Male Commuters			Female Commuters		
	Short (1-5 km)	Interim (6-20 km)	Long (>20 km)	Short (1-5 km)	Interim (6-20 km)	Long (>20 km)
Urban Dummy	1.223	1.580	0.401	-0.168	1.617	1.453
		(1.119)		(1.081)	(1.301)	(1.160)

Minorities share	-0.731*			-0.787		
	(0.302)			(0.368)		
Unemployment rate	-0.612		-1.491	-0.265	-0.986	-0.921
	(0.683)		(0.527)	(0.544)	(0.686)	(0.611)
Population		0.766**				
		(0.230)				
Population density	0.147	-0.006				
	(0.709)	(0.511)				
Literacy rate	-0.049		0.950	-0.410	0.282	0 .255
	(0.404)		(0.439)	(0.333)	(0.310)	(0.276)
Share of elderly		0.775	-1.217	-1.416*	-0.868	-0.969
		(0.679)	(.705)	(0.526)	(.688)	(0.614)
Agra	0.393	0.924	-1.139	-0.700	-1.374	-1.434
	(0.698)	(1.153)	(1.308)	(1.065)	(1.085)	(.967)
Allahabad	1.096	-.787	1.974	0.531	0.118	0.130
	(0.920)	(0.638)	(0.890)	(0.619)	(0.722)	(0.644)
Ghaziabad	0.184	1.788	-1.429	-1.238	-0.604	-0.209
	(0.684)	(1.414)	(1.554)	(0.900)	(1.150)	(1.025)
Jhansi	0.333	-0.176	-1.707	1.945	-0.030	0.248
	(1.068)	(0.678)	(0.761)	(1.063)	(1.040)	(0.927)
Kanpur	2.274*	-0.270	0.913	3.089**	2.088*	2.216*
	(0.804)	(0.850)	(0.855)	(0.813)	(0.970)	(0.865)
Lucknow	1.421	0.475	1.271	2.484*	2.171*	1.944 *
	(0.690)	(0.612)	(0.712)	(0.814)	(0.880)	(0.785)
Meerut	-0.210	0.907	-1.935	-1.089	-0.745	-0.547
	(0.952)	(0.956)	(1.159)	(0.698)	(0.897)	(0.800)
Constant	-1.298	-1.147	0.056	-0.544	-1.011	-1.020
	(0.820)	(0.806)	(0.802)	(0.736)	(0.947)	(0.844)
Adj R²	0.66	0.71	0.57	0.72	0.51	0.61
F-stat	3.42	4.32	2.80	4.15	2.44	3.16

The share of short trips is higher than the share of long trips for urban residents.

While high rates of unemployment reduce the share of trips in all the distance categories, it sharply reduces the share of long trips in the case of both men and women as compared to the share of short trips. This result is congruous with the results of the previous table.

High literacy rates strongly reduce the share of short trips and increase the share of long trips for both men and women. This squares with results presented by Korzhenevych and Jain (2018) who claim the greater mobility of better-paid people.

Population density has no explanatory power in this regression.

As the share of elderly in the population increases, the share of long trips decreases. This is probably true for elderly people and congruous with the results of Sharma and Chandrasekhar (2014).

Turning to the district effects, all the districts except Meerut have a positive effect on the share of short trips for men. This is only true for Allahabad, Jhansi, Kanpur, and Lucknow for women. The district of Kanpur has a significant positive effect on the share of both short trips and long trips, but the share of short-distance trips is higher than the share of long-distance trips for both men and women. This is also true in the case of Lucknow. While Agra, Ghaziabad and Meerut have a negative effect on the share of long-distance trips for both men and women, Allahabad, Kanpur, and Lucknow have a positive effect on the same.

For Allahabad, there exist huge differences in the size of regression coefficients between male and female commuters, with a stronger effect for male than female.

In accordance with the previous studies, e.g. Mahadevia and Advani (2016) and Korzhenevych and Jain (2018) higher literacy which is a substitute for higher income is associated with long distance commuting.

There are also no differences in the signs of coefficients of key explanatory variables between male and female commuters.

(II) (c) The superiority of public and non-motorized transport over individual motorized transport

While the majority of the commuting in both rural and urban areas is undertaken using slow modes of transport, the share of commuting by individual motorized modes is also not trivial. Promotion of a transport system which is climate-friendly requires the evasion of motorized modes of transport. Sims *et al.* (2014) advocate the usage of non-motorized transport for short-distances and public transport for long distances as a possible solution towards bringing about a low-carbon transport system. For this reason, in this section of the paper, we aim to locate the determinants of mode selection for short and long trips. The superiority of using non-motorized modes over individual motorized modes of transport for short trips and the superiority of public transport over individual motorized modes of transport for long trips, distinguished by gender have been used as the dependent variables (Table 15).

Table 15: OLS regression results for predominance measures. Author's own calculation based on Census data of 2011

	Male Commuters		Female Commuters	
	Dominance of NMT for short distances	Dominance of public transport for long distances	Dominance of NMT for short distances	Dominance of public transport for long distances
Urban Dummy	-0.831 (1.658)	-0.521 (0.578)	-2.407 (2.876)	1.461 (1.338)
Minorities share		0.416 (0.380)		-.100 (0.320)
Unemployment rate	1.779 * (0.722)	.518 (0.586)	-.116 (0.782)	
Population	0.849 ** (0.236)	0.641 (0.298)		0.466 (0.216)

Population density	0.437		0.323	-0.237 *
	(0.694)		(0.978)	(0.684)
Literacy rate	-1.032 *			
	(0.433)			
Share of elderly			-2.236 **	
			(0.721)	
Agra	-1.165	-0.0578	-3.387 **	-0.276
	(0.749)	(0.630)	(1.187)	(0.812)
Allahabad	-3.093 *	-1.483	0.452	-0.645
	(1.086)	(1.282)	(0.911)	(0.841)
Ghaziabad	-0.537	1.977	-3.055 *	1.151
	(0.717)	(.631)	(1.246)	(.699)
Jhansi	1.497	0.337	1.318	0.447
	(1.165)	(0.622)	(1.787)	(1.165)
Kanpur	.968	-1.058	2.401 *	0.469
	(0.637)	(0.973)	(1.055)	(0.741)
Lucknow	-1.306	-1.204	0.129	0.645
	(0.723)	(0.849)	(0.932)	(0.927)
Meerut	0.893	2.282	-2.405 *	1.316
	(0.954)	(0.729)	(1.034)	(0.767)
Constant	0.758	0.162	1.772	-1.119
	(0.779)	(0.600)	(1.352)	(0.581)
Adj R²	0.63	0.70	0.43	0.58
F-stat	3.15	4.13	2.04	2.91

The most important finding is that the urban dummy has a negative influence on both the superiority indicators for men. This means that men in urban areas are slowly becoming unsustainable and preferring to use private motorized vehicles over the cleaner modes for both short and long trips. An important point to note is that while women in urban areas do not prefer NMT for short distances, they do prefer public transport for long distances. It can, thus, be

117

interpreted that while both men and women in urban areas display unsustainable behavior, the pace with which women are catching-up on unsustainability is comparatively slower than men.

Unemployment rate has a positive effect on both the dominance indicators for men. Any increase in the unemployment rate will bring about a simultaneous increase in the number of men using NMT for short distances and public transport for long distances which are also cheaper as compared to motorized transport. This finding reaffirms the findings of the previous two tables.

In contrast to the findings of the paper by (Korzhenevych and Jain, 2018), population has a positive effect on both the dominance indicators. This might be because any increase in population will simultaneously increase the time cost of using private vehicles. To avoid that, a large number of people will prefer using NMT for short distances and public transport for long distances.

Literacy rate, which is representative of income, negatively influences the predominance of NMT for short trips, thereby reaffirming the findings of not only our previous table but also of the previous authors, e.g. Korzhenevych and Jain (2018) and Mahadevia and Advani (2016).

Turning to the district-specific results, while Agra has a negative effect on both the dominance indicators for men and women, Jhansi has a positive effect on the same. In Lucknow, while men disfavor the use of NMT for short distances and public transport for long distances, women favor the same. For women commuters, Kanpur too has a significant positive effect on the dominance of NMT for short distances. These results reaffirm the results of our previous analysis.

Amongst the eight districts, majority have a negative effect on the dominance indicators of men as against the women. Therefore, women in these districts of Uttar Pradesh have a lower carbon

footprint as compared to the men due to their limited use of motorized transport. This is congruous with the results of (Korzhenevych and Jain, 2018) for NCR.

4.2.1.3 Part-III

Travel behavior in selected urban and rural areas of Rajasthan

Table 16 finds that the entire population of Jaipur and Sainipura does not make a trip daily. Only about 89 per cent male and 67 per cent female make a trip daily in urban area as against 85 per cent male and 47 per cent female in rural area. It is the population of rural female that travels least frequently and the population of urban male that travels most frequently. With a shift in work status from non-working to working, more people tend to make a trip daily. The proportion of non-working male population making a trip daily is more than the percentage of non-working female population, irrespective of their area of residence. Female housewives, of both urban and rural areas, account for that part of the total population which is the most unlikely to make a trip daily. From among the total male population in the study area, it is those who are unemployed who make the least regular trips.

Table 16: Trip incidence and most frequently travelled distance by work status, area and sex. Source: Primary survey

Work Status	% of total population making a trip daily				Most frequently travelled distance			
	Urban		Rural		Urban		Rural	
	Female	Male	Female	Male	Female	Male	Female	Male
Housewife	36.46	--	0	--	0-5km	--	0-5km	--
Student	57.41	76.19	50	82.35	0-5km	0-5km	15-25 km	15-25 km
Unemployed	41.18	36.84	0	63.64	0-5km	0-5km	0-5km	25-35 km
Self-employed	100	97.83	0	92.86	0-5km	0-5km	0-5km	0-5km
Salaried	100	94.08	100	93.75	0-5km	5-15 km	0-5km	35-50 km
Casual labour	100	94.83	85.7	77.78	0-5km	0-5km	0-5km	0-5km
Total	67.02	88.96	47.06	85.19	0-5km	0-5km	0-5km	0-5km

On the whole, the population of the study area travels a distance of 0-5 km. The entire population of Jaipur usually travels a distance of not more than 5 km. It is only the salaried male in the city who travels a little further to a distance more than 5 km but less than 15 km. The situation of travel behavior within different occupations in Sainipura is somewhat different from that of Jaipur. While majority of the female population in the area travels short distances, it is only the students who travel a distance between 15 km to 25 km. It is the population of rural male which travels the most varied distances. Male students, similar to female students, travel a distance between 15 km to 25 km. It is the male earning regular salaries who travel the farthest. Even the unemployed travel distances as long as 35 km. The group of rural male population which travels the shortest includes self-employed and casual labor. One possible explanation for the rural population travelling further than the urban population is the difference in the land use pattern (Mahadevia and Advani, 2016, Sharma, 2019) in the two study areas. Absence of higher education institutions within the village demands students to travel a distance longer than that in the city. Male who are unemployed also search for work outside the premises of the village. Absence of any such organization within the village which provides a regular fixed source of income demands the people earning salaries to travel a distance of 35-50 km.

According to Wilbur Smith and MoUD (2008), the modal share in Jaipur was: walking 26 per cent, cycle 13 per cent, motorized two wheeler 26 per cent, public transport 22 per cent, motorized four wheeler 4 per cent, and intermediate public transport 4 per cent. Our study finds the modal share in Jaipur on the whole is as follows: walking 27 per cent, cycle 2 per cent, motorized two-wheeler 36 per cent, motorized four-wheeler 9 per cent, tractors 0.2 per cent, public transport 25 per cent and hired taxi 1 per cent. The modal share in Sainipura according to the findings of our study is: walking 42.28 per cent, cycle 0.67 per cent, motorized two-wheeler 20.81 per cent, motorized four-wheeler 4.70 per cent and public transport 31.54 per

cent. While the most commonly used mode of transport in Jaipur is motorized two-wheeler, which in Sainipura is walking.

Table 17 shows that there exist differences in modal choice by occupation, area and gender. Cycle is a mode which almost the entire population does not resort to. It is only the casual labor in urban area that uses it. The most commonly used mode of transport by urban housewives is walking and that by those in rural area is public transport. Possible explanation why housewives in rural area depend on public transport heavily is the built-in environment or land use pattern in the village where they mostly need to travel outside the village for majority of the purposes. Majority of the population of students, irrespective of the area or gender uses public transport. A growing percentage of students in urban area, especially men are beginning to use motorized two-wheelers too. The entire population of female students living in rural area uses only public transport. There exist gender differentials within this group of population of students with male students switching over to modes other than public transport. One mode of transport used by students in urban area and not in rural area is motorized four-wheelers. In both urban and rural areas, there exist gender differences in the mode of transport most commonly used by the unemployed. While female primarily depend on using the public transport, male is found to use the motorized two-wheelers. In the urban area, a large section of the unemployed also depend on walking which is not the case in rural area.

Table 17: Modal share by work status, area and sex. Source: Primary survey

Mode of transport	Housewife				Student			
	Urban		Rural		Urban		Rural	
	Female	Male	Female	Male	Female	Male	Female	Male
Walking	62.50	--	3.45	--	22.22	26.19	0	17.65
Cycle	0	--	0	--	0	0	0	0
MTW	19.80	--	17.24	--	20.37	33.33	0	11.76
MFW	7.29	--	10.34	--	1.85	4.76	0	0
Public transport	8.33	--	68.97	--	55.56	35.71	100	70.59
Others	2.08	--	0	--	0	0	0	0
Total	100	--	100	--	100	100	100	100

Mode of transport	Unemployed				Self-employed			
	Urban		Rural		Urban		Rural	
	Female	Male	Female	Male	Female	Male	Female	Male
Walking	35.29	31.58	0	18.18	44.44	15.22	100	67.86
Cycle	0	10.53	0	9.09	0	2.17	0	0
MTW	23.53	47.37	33.33	45.45	22.22	56.52	0	21.43
MFW	5.88	10.53	0	0	33.33	19.57	0	10.71
Public transport	35.29	0	66.67	27.27	0	6.52	0	0
Others	0	0	0	0	0	0	0	0
Total	100	100	100	100	100	100	100	100
Mode of transport	Salaried				Casual labor			
	Urban		Rural		Urban		Rural	
	Female	Male	Female	Male	Female	Male	Female	Male
Walking	22.22	8.55	90.91	37.50	45.65	25.86	57.14	77.78
Cycle	0	2.63	0	0	0	5.17	0	0
MTW	38.10	56.58	4.55	62.50	4.35	29.31	0	11.11
MFW	7.94	13.16	0	0	0	0	0	11.11
Public transport	26.98	17.11	4.55	0	50.00	39.66	42.86	0
Others	4.76	1.97	0	0	0	0	0	0
Total	100	100	100	100	100	100	100	100

Note: MTW= motorized two-wheeler, MFW= motorized four-wheeler, public transport= bus, autorickshaw, train, jeep.

There exists gender differential in modal choice among urban self-employed. While the female here depends heavily on walking, male depend on motorized two-wheelers. In the rural areas, self-employed people, both men and women walk. Amongst the salaried people, in the rural areas there exist gender differences with men using motorized vehicles and women walking. Surprisingly, the gap between salaried men and women is bridging in urban areas with a large proportion of them using motorized vehicles. However, a large percentage of salaried women, more than men in both urban and rural areas, depend on non-motorized means of transport and public transport. Women's current mobility levels prove their higher sustainability. However, this sustainability is not arising from choice (Mahadevia and Advani, 2016). The reason for this existing difference in modal use can be due to women's lesser access to motorized vehicles and their travelling shorter distances for a number of reasons like safety.

While the maximum proportion of female casual labor in both urban and rural areas either walks or takes the public transport, the male not only use the public transport but a growing percentage of them also uses motorized vehicles.

Table 18 which show proportion of different purposes for which the population travels most frequently has been divided into two broad categories of working and non-working people. Purposes such as health, visiting relatives and friends, religious activities, sports/ recreational activities, eating out, and picking up or dropping off someone are included in the 'others' category. The major purposes for which housewives in the urban and rural area travel is not education but shopping and other activities. In the urban area, while the unemployed female travels primarily for education, the unemployed male travel for shopping and other purposes. This is in contrast to the rural area where the unemployed female travels for shopping and unemployed male for education. The major purpose for which working people travel most frequently is work and that for which the non-working travel is education.

Table 18: Trips by purpose, work status, area and sex. Source: Primary survey

Non-working											
Purpose	Housewife				Student				Unemployed			
	Urban		Rural		Urban		Rural		Urban		Rural	
	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male
Work	0	--	0	--	0	0	0	0	0	0	0	0
Education	3.13	--	0	--	87.04	97.62	83.33	82.35	52.94	21.05	33.33	63.64
Shopping	41.67	--	20.69	--	1.85	2.38	0	0	29.41	36.84	66.67	9.09
Others	55.21	--	79.31	--	11.11	0	16.67	17.65	17.65	42.11	0	27.27
Total	100	--	100	--	100	100	100	100	100	100	100	100

Working				
Purpose	Self-employed, Salaried, Casual Labor			
	Urban		Rural	
	Female	Male	Female	Male
Work	100	100	100	100
Education	0	0	0	0
Shopping	0	0	0	0
Others	0	0	0	0
Total	100	100	100	100

Table 19 describes the modes of transport used for different purposes. For travelling to work, while the women in urban area either walk or use the public transport, men in the city dominantly depend on using motorized two-wheelers. The population in rural area primarily depends on walking with a growing percentage of male users of motorized two-wheelers. In the urban area, female take public transport and male use motorized two-wheelers for education. In the rural area, the population depends primarily on public transport for this purpose with a rising percentage of motorized two-wheeler users. Shopping is a purpose for which the urban female usually walks and urban male usually uses motorized two-wheelers. For the same purpose rural female takes public transport and rural male uses motorized two-wheelers. For purposes other than education, shopping and work urban population and rural male use motorized two-wheelers whereas rural female takes public transport. It can be noticed that for majority of the purposes women either take the public transport or walk in both urban and rural areas as against the men who depend heavily on motorized two-wheelers. One mode of transport which is used by a small percentage of overall transport is motorized four-wheelers. It mostly has male users.

Table 19: Modal share by purpose, area and sex. Source: Primary survey

Mode of transport	Work				Education			
	Urban		Rural		Urban		Rural	
	Female	Male	Female	Male	Female	Male	Female	Male
Walking	33.05	13.67	83.33	60.38	20	23.08	0	9.52
Cycle	0	3.13	0	0	0	2.56	0	0
MTW	23.73	50.39	3.33	32.08	21.67	43.59	16.67	28.57
MFW	6.78	11.33	0	7.55	0	2.56	0	0
Public transport	33.90	20.31	13.33	0	58.33	28.21	83.33	61.90
Others	2.54	1.17	0	0	0	0	0	0
Total	100	100	100	100	100	100	100	100
Mode of transport	Shopping				Others			
	Urban		Rural		Urban		Rural	
	Female	Male	Female	Male	Female	Male	Female	Male
Walking	39.66	15.42	4.55	14.29	31.82	8.93	33.55	33.33
Cycle	0	3.33	0	7.14	0	3.57	0	0

MTW	28.69	53.75	18.18	40.00	46.97	53.57	10.97	66.67
MFW	12.24	16.25	0	5.71	18.18	31.55	3.23	0
Public transport	15.61	10.42	77.27	32.86	3.03	0	50.97	0
Others	3.80	0.83	0	0	0	2.38	1.29	0
Total	100	100	100	100	100	100	100	100

Note: MTW= motorized two-wheeler, MFW= motorized four-wheeler, public transport= bus, autorickshaw, train, jeep.

Table 20 shows the shares of different modes of transport used for different distance categories. For a distance up to 5 km urban female prefer walking, urban male use motorized two-wheelers, rural female either walk or use the public transport and rural male prefer walking. For a distance more than 5 km up to 15 km, urban female uses either motorized two-wheelers or public transport, urban male mostly resorts to motorized two-wheelers. The entire sample population of rural female resort to public transport for this distance, in contrast to the male who take motorized two-wheelers. For distances longer than 35 km, women's use of motorized two-wheelers almost becomes nil and they either resort to using public transport or motorized four wheelers. While in urban area men take public transport for distances longer than 35 km, those in the rural area still use motorized two-wheelers. As distance increases, use of public transport by women also increases.

Table 20: Modal share by distance categories, area and sex. Source: Primary survey

Mode of transport	0-5 km				5-15 km			
	Urban		Rural		Urban		Rural	
	Female	Male	Female	Male	Female	Male	Female	Male
Walking	57.07	35.37	44.64	77.50	0	0	0	0
Cycle	0	4.08	0	0	0	2.73	0	0
MTW	17.56	43.54	7.14	15.00	37.74	63.64	0	100
MFW	1.95	5.44	1.79	2.50	16.98	15.45	0	0
Public transport	22.44	11.56	46.43	5.00	39.62	16.36	100	0
Others	0.98	0	0	0	5.66	1.82	0	0
Total	100	100	100	100	100	100	100	100
Mode of transport	15-25 km				25-35 km			
	Urban		Rural		Urban		Rural	
	Female	Male	Female	Male	Female	Male	Female	Male
Walking	0	0	0	20.83	0	0	0	10.00
Cycle	0	4.00	0	4.17	0	0	0	0

MTW	29.41	36.00	20.00	37.50	25.00	53.85	66.67	20.00
MFW	17.65	20.00	20.00	4.17	25.00	0	0	20.00
Public transport	52.94	36.00	60.00	33.33	50.00	46.15	33.33	50.00
Others	0	4.00	0	0	0	0	0	0
Total	100	100	100	100	100	100	100	100
Mode of transport	35-50 km				>50 km			
	Urban		Rural		Urban		Rural	
	Female	Male	Female	Male	Female	Male	Female	Male
Walking	0	0	0	0	0	0	0	0
Cycle	0	0	0	0	0	0	0	0
MTW	0	0	0	100	0	25.00	0	100
MFW	0	15.38	50.00	0	0	12.50	50.00	0
Public transport	100	84.62	50.00	0	100	62.50	50.00	0
Others	0	0	0	0	0	0	0	0
Total	100	100	100	100	100	100	100	100

Note: MTW= motorized two-wheeler, MFW= motorized four-wheeler, public transport= bus, autorickshaw, train, jeep.

Table 21 describes the most frequently travelled distance for different purposes. The analysis of purpose-wise distance travelled enables the understanding of land use pattern in the region. Sainipura is a medium-size village located in an area of approximately 3 square kilometers. Absence of efficient educational institutions nearby requires the population to travel distances longer than that travelled in the city. Women's current mobility levels prove their higher sustainability. However, this sustainability is not arising from choice (Mahadevia and Advani, 2016).

Table 21: Trip purpose by distance categories, area and sex. Source: Primary survey

Distance	Work				Education			
	Urban		Rural		Urban		Rural	
	Female	Male	Female	Male	Female	Male	Female	Male
0-5 km	70.34	44.71	100	83.02	62.71	46.67	16.67	33.33
5-15 km	21.19	35.29	0	1.89	25.42	37.78	0	4.76
15-25 km	5.08	7.84	0	1.89	6.78	8.89	66.67	23.81
25-35 km	1.69	4.71	0	3.77	0	2.22	16.67	38.10
>35 km	1.70	7.46	0	9.43	5.08	4.44	0	0
Total	100	100	100	100	100	100	100	100
	Shopping				Others			
	Urban		Rural		Urban		Rural	
	Female	Male	Female	Male	Female	Male	Female	Male
0-5 km	78.26	87.50	87.50	100	79.03	62.50	79.17	100

5-15 km	15.22	12.50	0	0	9.68	25.00	4.17	0
15-25 km	6.52	0	0	0	6.45	12.50	4.17	0
25-35 km	0	0	12.50	0	3.23	0	4.17	0
>35 km	0	0	0	0	1.61	0	8.33	0
Total	100	100	100	100	100	100	100	100

4.2.1.4 Part-IV

(A) Descriptive analysis

This paper attempts to address the similar and dissimilar impacts created by different socioeconomic factors on choice of mode of transport of men and women in two different geographical locations. In both urban and rural area, with an improvement in the socioeconomic status, there is a dip in the proportion of individuals walking and rise in the proportion of those using motorized vehicles. We observe a differentiating impact created by socioeconomic status on usage of public transport by men and women in the two areas. In the urban area, on one hand, while the proportion of men who use public transport decline as the socioeconomic status improves, the proportion of women users eventually sees an upsurge. In the rural area, on the other hand, with an improvement in socioeconomic status, the proportion of men using this mode increases while the proportion of women users sees a decline. The use of hired taxi in the city for frequent travelling purposes is, however, close to minimal but increases with an improvement in socioeconomic status. In the urban area, while in the lowest socioeconomic group, men usually use motorized two-wheelers and women usually walk, in the highest socioeconomic group, women switch over to public transport and men still depend on motorized two-wheelers. On the contrary, in the rural area, in the lowest socioeconomic group, men walk and women use public transport while in the highest socioeconomic group men switch over to public transport and women continue to use the same (Figure 9 and 10).

127

Figure 9: Modal share by socioeconomic status in urban area. Source: Primary survey
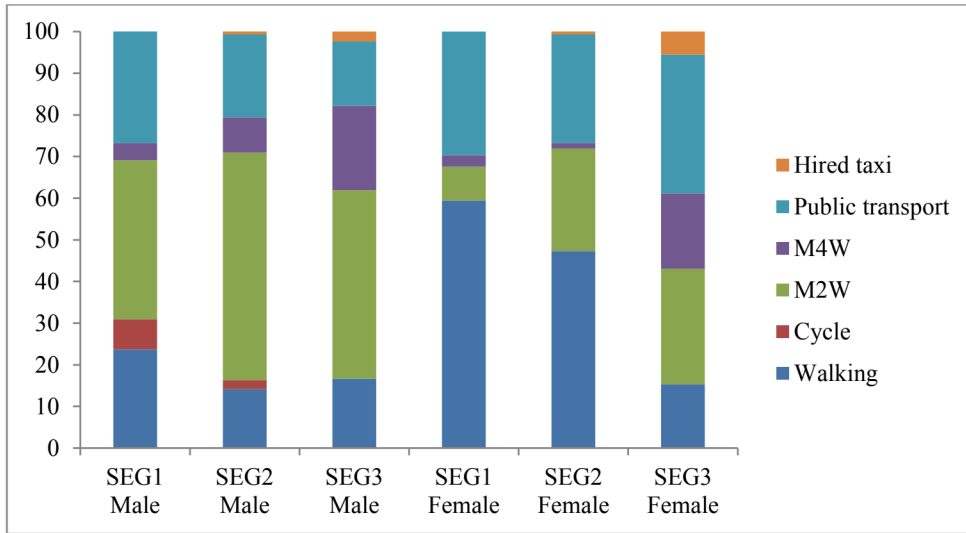
Figure 10: Modal share by socioeconomic status in rural area. Source: Primary survey
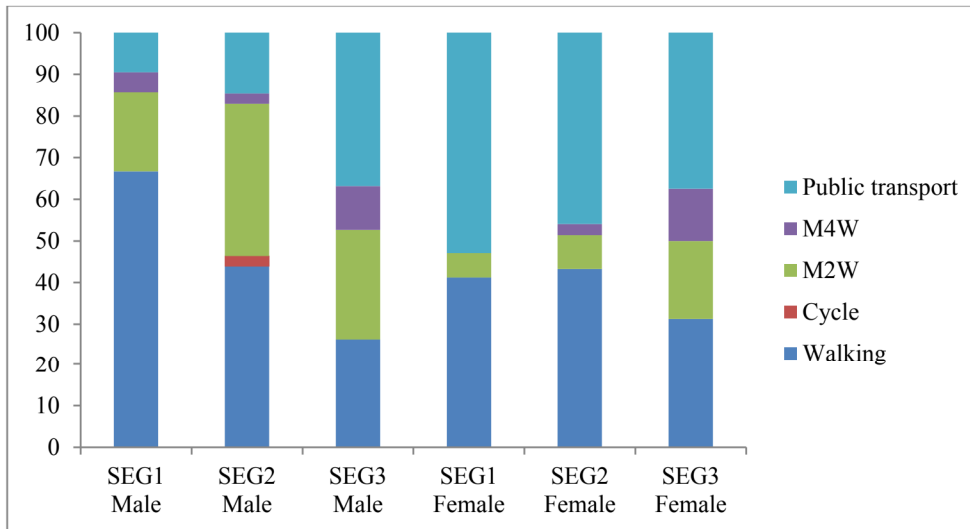
In the urban area, individuals who are working prefer walking lesser as compared to individuals who are non-working. Usage of motorized vehicles is found higher amongst working individuals. Though a significant proportion of population of working men depends on motorized vehicles, their usage of public transport can hardly be discriminated by their work

status. Usage of public transport among women, however, is higher among those who are working (Figure 11). An almost contrasting trend has been observed in the rural area where working women mostly walk and non-working women mostly use public transport. The usage of motorized vehicles, also, is supposedly higher amongst non-working women as compared to the working ones. Working men, on the other hand, either walk or use motorized vehicles, non-working either walk or use public transport (Figure 12).

Figure 11: Modal share by work status in urban area. Source: Primary survey
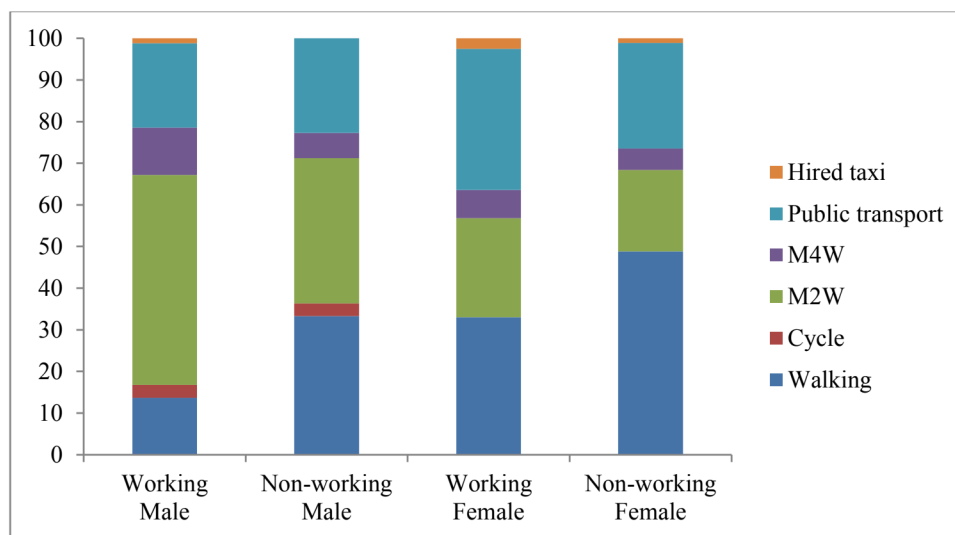
Figure 12: Modal share by work status in rural area. Source: Primary survey
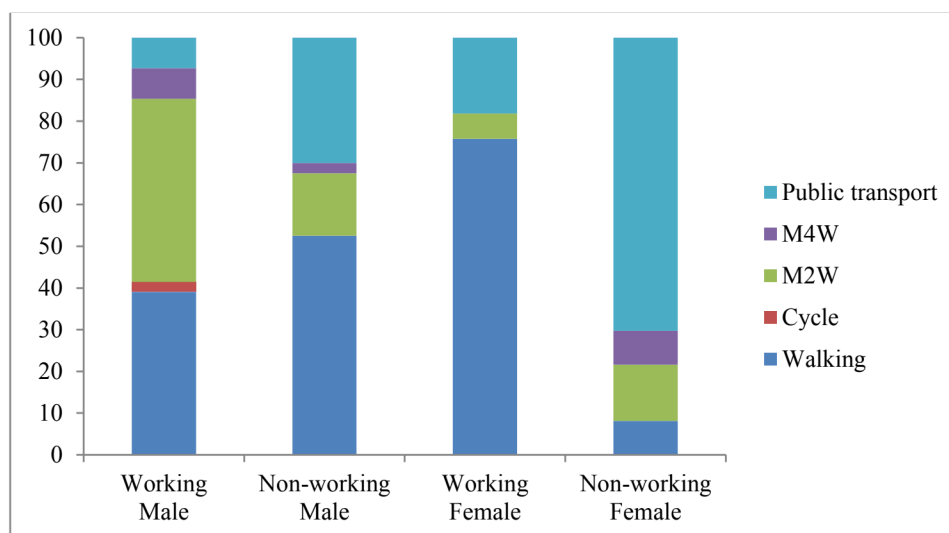
With increase in the years of schooling, the proportion of individuals walking for frequent purposes is found to decline, irrespective of the location or sex. Among men, while in the urban area, majority of the public transport users are those who are the least educated, in the rural area the maximum usage is made by the most educated. Majority of the women users of public transport belong to the most educated group in urban area and the medially educated group in the rural area. Use of motorized vehicles, in both urban and rural area and amongst both men and women, is seen to increase with an increase in the years of schooling (Figure 13 and 14).

Figure 13: Modal share by level of education attained in urban area. Source: Primary survey
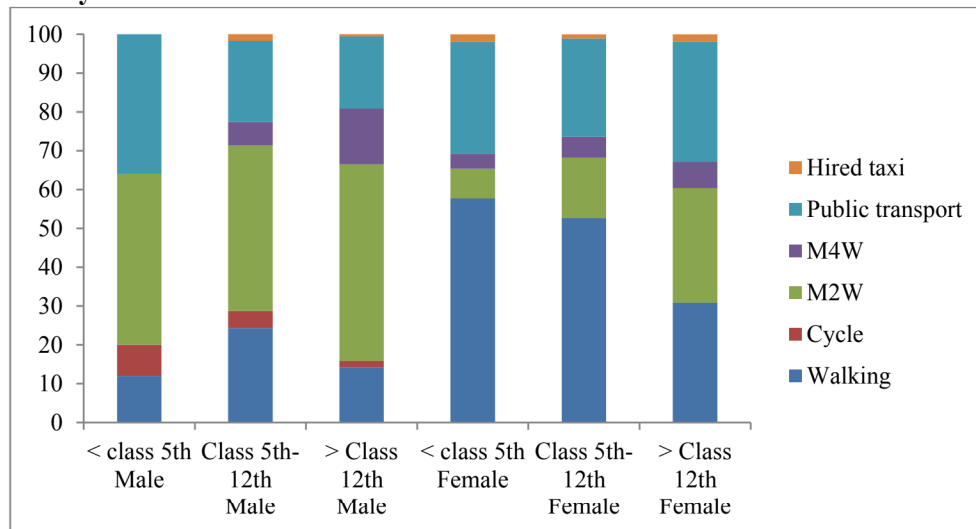
Figure 14: Modal share by level of education attained in rural area. Source: Primary survey
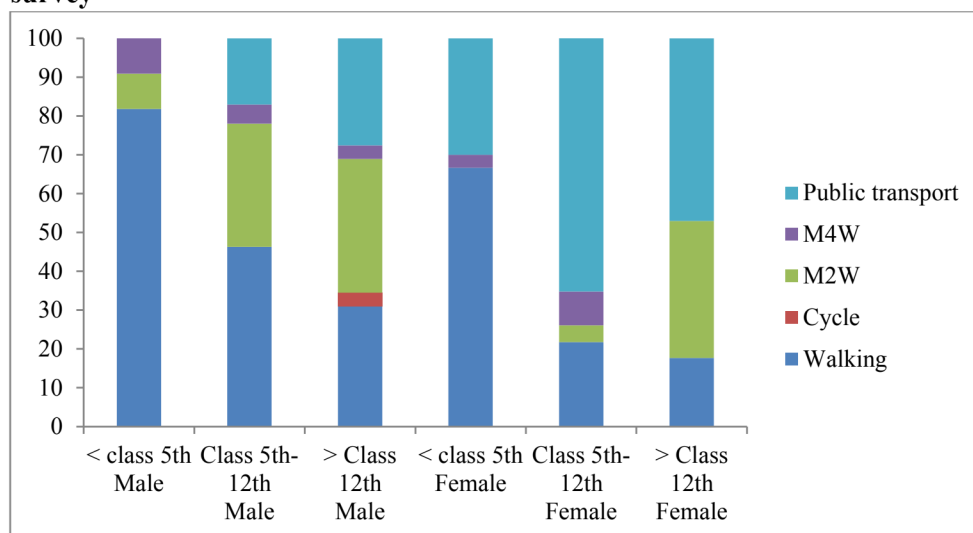
In urban area, majority of the men, irrespective of the impact of any socioeconomic factor, are found to depend on motorized vehicles as against majority of the women who either walk or use public transport. In the rural area, men either walk or use motorized two-wheelers while women usually walk or use public transport.

Table 22 presents a summary of sample characteristics. It shows the share of different modes of transport in total mode use. Cycle is a mode which is used only by a small percentage of men. Women usually do not resort to cycling. The table also displays the distribution of sample population amongst different categories.

Table 22: Summary of sample statistics. Source: Primary survey

Characteristics	Percentage of respondents			
	Urban Male	Urban Female	Rural Male	Rural Female
Mode of transport used:				
Walking	17.70	42.47	45.68	40.00
Cycle	3.11	--	1.23	--
Motorized two-wheelers	47.20	21.23	29.63	10.00

Motorized four-wheelers	10.25	5.82	4.94	4.29
Public transport	20.81	28.77	18.52	45.71
Hired taxi	0.93	1.71	--	--
Monthly per capita consumption expenditure (in INR[a]):				
≤ 2500	31.54	25.18	25.93	24.29
2501-7000	44.30	50.71	50.62	52.86
>7000	24.16	24.11	23.46	22.86
Missing data of monthly per capita consumption expenditure	7.45	3.42	--	--
House ownership (Only of respondents with missing data):				
Occupied rent-free	12.50	30.00	--	--
Rented	37.50	30.00	--	--
Owned	50.00	40.00	--	--
House type (Only of respondents with missing data):				
Kutccha	--	--	--	--
Semi-pucca	16.67	30.00	--	--
Pucca	83.33	70.00	--	--
Work status:				
Non-working	20.50	59.59	49.38	52.86
Working	79.50	40.41	50.62	47.14
Education:				
Less than class 5th	7.76	17.81	13.58	42.86
Class 5th to class 12th	35.71	31.16	50.62	32.86
Above class 12th	56.52	51.03	35.80	24.29
Average Age	32.56	32.22	32.39	34.06

(B) Estimation results of multinomial logit models of mode choice

The descriptive analysis displayed in the previous section hint at the existing relationship between travel mode choice and socioeconomic variables. A quantitative explanatory model of choice probabilities is expected to complement the exploratory analysis. This study uses a multinomial logit framework to model the travel mode choice probabilities.

Table 23: MNL model results for impact of socioeconomic factors on choice of mode of transport by men in urban area. Source: Primary survey

Variable	Cycle	Motorized two-wheeler	Motorized four-wheeler	Public transport	Hired taxi
Education (ref: >12th):					
< class 5th	16.204 (1604.032)	-1.637*** (0.634)	-18.009 (3375.966)	-1.192* (0. 682)	-16.338 (7339.686)
Class 5th - 12th	16.331 (1604.032)	-0.960** (0.403)	-1.483** (0.596)	-0.341 (0.446)	-0.278 (1.391)
Work status (ref: non-working)	0.661 (0.915)	1.601*** (0.403)	2.062*** (0.649)	0.895** (0.443)	17.825 (3854.952)
Socioeconomic group (ref: SEG3):					
SEG1	15.773 (2064.881)	-0.281 (0.479)	-1.438** (0 .716)	0.187 (0.536)	-17.706 (4013.086)
SEG2	15.454 (2064.881)	0. 524 (0.457)	-0.394 (0.572)	0.361 (0.521)	-1.045 (1.401)
Motorized vehicle ownership (ref: do not own)	2.085* (1.153)	1.052*** (0.383)	1.506** (0.699)	-0.099 (0.401)	17.351 (3738.475)
Cost of travel	0.006 (0.014)	0.008 (0.008)	0.007 (0.010)	0.011 (0.009)	-0.055 (0.067)
Constant	-35.192 (2614.699)	-0.689 (0. 505)	-2.195*** (0.846)	-0.514 (0.540)	-35.017 (5369.995)
Pseudo R^2	0.126				
Log likelihood	-381.180				
Chi-Square	110.16				
Sample size	318				

Note: Walking is reference alternative; standard error in parenthesis.
*** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

To check for the aptness of application of a MNL framework, the independence of irrelevant alternatives (IIA) assumption was tested employing the Hausman-McFadden method and the Small-Hsiao method (Cheng and Long, 2007) which confirm the non-violation of IIA assumption. The study employs four different MNL models of mode choice for men and women of urban and rural area. Walking is taken as the reference alternative.

Table 24: MNL model results for impact of socioeconomic factors on choice of mode of transport by women in urban area. Source: Primary survey

Variable	Motorized two-wheeler	Motorized four-wheeler	Public transport	Hired taxi
Education (ref: >12th):				
< class 5th	-2.800***	-1.180	-0.725*	-2.394
	(0.797)	(1.237)	(0.433)	(2.460)
Class 5th - 12th	-1.275***	-0.939 (0.770)	-0.654*	0.634
	(0. 427)		(0.366)	(1.377)
Work status (ref: non-working)	0.974***	1.017*	0.764**	0.454
	(0.373)	(0.599)	(0.323)	(1.258)
Socioeconomic group (ref: SEG3):				
SEG1	-1.627**	-2.491**	-1.191**	-17.581
	(0.647)	(0.974)	(0.508)	(580.461)
SEG2	-0.845*	-3.337***	-1.266***	-3.669**
	(0.460)	(0.867)	(0.442)	(1.457)
Motorized vehicle ownership (ref: do not own)	0.222	1.435	-0.284	-1.587
	(0.423)	(1.104)	(0.336)	(1.470)
Cost of travel	0.025**	0.023	0.021**	0.090***
	(0.011)	(0.017)	(0.010)	(.027)
Constant	0.089	-1.514	0.731	-1.577
	(0.571)	(1.179)	(0.495)	(1.545)
Pseudo R^2	0.157			
Log likelihood	-313.87397			
Chi-Square	116.94			
Sample size	289			

Note: Walking is reference alternative; standard error in parenthesis.
*** p < 0.01; ** p < 0.05; * p < 0.1.

The least educated category of men and women in both urban and rural areas have lower odds of using motorized two-wheelers and higher odds of walking as compared to the most educated category. With increase in years of schooling, their odds of choosing to walk appear to decline. The category with the lowest level of education is the least likely to use public transport and the most likely to walk as against the most educated category of individuals. As years of education increase, the odds of using public transport over walking increase.

Table 25: MNL model results for impact of socioeconomic factors on choice of mode of transport by men in rural area. **Source: Primary survey**

Variable	Cycle	Motorized two-wheeler	Motorized four-wheeler	Public transport
Education (ref: >12th):				
< class 5th	-37.801	-2.583	-1.703	-23.704
	(83161.28)	(1.604)	(2.379)	(43858.01)
Class 5th - 12th	-34.948	-.006	-0.689	-0.674
	(11934.46)	(0.817)	(1.636)	(0.809)
Work status (ref: non-working)	36.163	1.536**	2.356	-0.548
	(15663.04)	(0.762)	(1.684)	(0.981)
Socioeconomic group (ref: SEG3):				
SEG1	-1.874	-0.996	-1.987	-1.832
	(44322.24)	(1.002)	(1.525)	(1.168)
SEG2	0.690	-1.344	-2.996*	-2.042**
	(29776.44)	(0.925)	(1.718)	(0.948)
Motorized vehicle ownership (ref: do not own)	1.431	-0.733	-0.202	-1.832**
	(26250.87)	(0.765)	(1.471)	(0.863)
Cost of travel	-7.623	0.065**	0.036	0.068**
	(743.221)	(0.026)	(0.039)	(0.028)
Constant	-22.394	-0.224	-1.273	1.874
	(40853.9)	(1.180)	(2.069)	(1.122)
Pseudo R^2	0.310			
Log likelihood	-68.908			
Chi-Square	62.00			
Sample size	81			

Note: Walking is reference alternative; standard error in parenthesis.
*** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

The coefficient of work status is both positive and significant for most of the modes in the urban area. Working individuals, in this region, have higher odds of choosing motorized vehicles or public transport and lower odds of walking as compared to the non-working individuals. The results from the rural area are rather contrasting. While working men here have higher odds of choosing a motorized vehicle over walking than their non-working counterparts, working women, on the other hand, have lower odds of choosing not only motorized vehicles but also public transport and have higher odds of choosing to walk as compared to non-working women. The reason for this can be that most women in rural area work on farms within the premises of the village. Other major purposes, such as education and health, for which the non-working population in the village travels to is mostly located outside the village boundaries.

Table 26: MNL model results for impact of socioeconomic factors on choice of mode of transport by women in rural area. Source: Primary survey

Variable	Motorized two-wheeler	Motorized four-wheeler	Public transport
Education (ref: >12th):			
< class 5th	-27.908	392.525	-2.797*
	(79393.18)	(118142.2)	(1.536)
Class 5th - 12th	-2.809*	356.133	0.288
	(1.650)	(64125.7)	(1.254)
Work status (ref: non-working)	-4.498**	-80.137	-4.254***
	(1.779)	(23870.48)	(1.206)
Socioeconomic group (ref: SEG3):			
SEG1	-0.831	-3787.683	0.301
	(2.311)	(587311.7)	(1.348)
SEG2	-1.638	-35.759	-0.101
	(1.488)	(9541.02)	(1.140)
Motorized vehicle ownership (ref: do not own)	0.200	-95.865	-1.278
	(1.408)	(100747.7)	(0.881)
Cost of travel	0.032	6.598	0.071
	(0.087)	(1004.26)	(0.081)
Constant	4.818**	-407.252	4.124**
	(2.304)	(119390.7)	(2.022)

Pseudo R^2	0.602
Log likelihood	-30.397
Chi-Square	91.75
Sample size	70

Note: Walking is reference alternative; standard error in parenthesis.
*** p < 0.01; ** p < 0.05; * p < 0.1.

The highest socioeconomic group, SEG3, is the reference category. SEG1 and SEG2 people have lower odds of choosing motorized vehicles and higher odds of choosing to walk as compared to SEG3 people, irrespective of their gender or location of residence. The significant results of women in urban area and men in rural area for impact of socioeconomic variables on choice of public transport also reveals that SEG1 and SEG2 individuals have lower odds of choosing public transport over walking as compared to SEG3 individuals. SEG2 women of the middle socioeconomic group in the urban area have significantly lower odds of choosing a hired taxi and higher odds of walking as against the best-off category of individuals. From the significant values of women in urban area, it can also be possibly noted that as income increases, the odds of choosing motorized two-wheelers and hired taxis over walking also increases, while the odds of taking a motorized four-wheeler or public transport over walking seems to decline.

Ownership of motorized vehicle significantly influences choice of travel mode for men. Those who own them have higher odds of choosing motorized modes over walking. Increase in cost of travel by a rupee increases the odds of choosing motorized vehicles and public transport over walking, by significantly smaller amounts.

Table 27: Aggregate point elasticity estimates. **Source: Primary survey**

Variable	Walking	Cycle	M2W	M4W	Public transport	Hired taxi
Education (ref: >12th):						

< class 5th Class 5th - 12th	0.306(UF) 0.547(RM) 0.602(RF) 0.227(UF)		-0.236(UF) -0.233(RF) -0.317(RM) -0.132(UF)	-0.096(UM)	-0.204(RM)	
Work status (ref: non-working)	-0.249(UM) -0.195(UF) 0.772(RF)				-0.772(RF)	
Socioeconomic group (ref: SEG3): SEG1 SEG2	0.323(UF) 0.281(UF)		-0.136(UF)	-0.046(UF) -0.118(UF)		

Note: UM= Urban Male, UF= Urban Female, RM= Rural Male, RF= Rural Female. Blank cells indicate that the corresponding values were non-significant at 90% confidence level.

As part of the post-estimation analysis of the results, point elasticity estimates of choice of mode of transport against different explanatory variables, were calculated at the mean values of the covariates for all four categories of data. Urban female with least years of education is approximately 30.6% more probable to walking as against the most educated category of individuals in the category. Men in urban areas with least years of education have about 9.6 % lower probability of using a motorized two-wheeler as compared to men with the most years of education in the area. Working women in rural areas are about 77.2% more likely to walking as compared to their non-working counterparts. Working men in urban areas have about 25% lower probability of walking as against non-working urban men. Women belonging to SEG1 in urban areas are about 13.6% less probable to using motorized two-wheelers as compared to their counterparts in SEG3.

The estimates for different education groups, work status and socioeconomic status for walking, motorized vehicle and public transport indicates that these modes are sensitive to some or all of the explanatory variables, reaffirming the role of these variables in mode choice. The positive elasticity estimates for different education groups means that the less educated are more likely to be choosing to walk than the most educated ones. While in the urban area the working individuals are less likely to walk as compared to the non-working individuals, the female working in rural area have a higher likelihood of walking than their non-working counterparts. Women in urban areas in the lower socioeconomic groups have higher odds of walking than those of them in higher socioeconomic groups. The probability of using a motorized two-wheeler by lower education group individuals is lower than the higher education group individuals. The less educated as compared to the most educated, the least socioeconomically well-off as against the best-off are less likely to be using motorized four-wheelers in the urban area. The least educated men and working women in rural area are less likely to be opting public transport than their educated and non-working counterparts.

4.2.2 Section-II
Overview

This section of the chapter refers to the findings of the second objective of thesis. In order to examine gender differences in travel behavior with respect to income groups, we split this section into three parts. The first part studies gender and class distinction in different measures of travel pattern. The second part examines the role of socioeconomic characteristics on gender differences in travel mode and the third part examines the same for purposes other than work.

The analysis on this objective has been presented in (Saigal *et al.*, 2020a; 2021d, 2021b, 2021c)

4.2.2.1 Part-I

Travel behavior adjusted by gender and class in Jaipur

The entire population is not making a trip daily. Table 28 show that only 65 per cent female and 87 per cent male make a trip every day. However, with an improvement in the socioeconomic status, fewer women and more men tend to make a trip daily. Mahadevia (2012) finds that with an increase in family income, women are likely to shift out of the labor force in India, thereby declining the need to make a trip every day. Workforce participation is the major cause of everyday trips.

Table 28: Trip incidence and trip length by socioeconomic groups and sex. Source: Primary survey

Socio-economic group	% of total population making a trip daily		Most frequently travelled distance	
	Female	Male	Female	Male
SEG 1	54.05	80.41	0-5 km	0-5 km
SEG 2	73.29	90.07	0-5 km	0-5 km
SEG 3	61.11	90.48	0-5 km	5-15 km
Total	65.41	87.27	0-5 km	0-5 km

Majority of the population in Jaipur travels short distances of not more than 5 km. On an average there exists no gender discrimination in this. The reason why women usually travel short distances can be due to the existence of gender differences in access to owned vehicles and feminization of responsibilities within a household (Mahadevia and Advani, 2016).

Table 29 shows gender and class difference in modal share. On the whole, the most commonly used mode of transport by women is walking whereas that by men is motorized two-wheeler as a driver. This trend is observed in SEG1 as well as SEG2. In SEG3 women shift to using public transport as the most commonly used mode of transport while men still prefer driving

the motorized two-wheelers. The proportion of women drivers of motorized two-wheelers increases with an improvement in socioeconomic class. The overall use of motorized four-wheelers is low irrespective of the socioeconomic groups. We observe increase in the percentage of men driving four-wheelers, with the highest percentage in SEG3. One of the positive changes worth noticing here is the swap in the percentage of women as drivers and women as passengers of four-wheelers in SEG3. While 11 per cent of women drive, 7 per cent use four-wheelers as passengers. There also exists gender difference in the use of public transport irrespective of the socioeconomic class with continuous decline in the percentage of men users as the socioeconomic class improves. The ratio of female to male in use of public transport is low in SEG1 at 1.14, increases slightly in SEG2 at 1.28 and is the highest in SEG3 at 2.05. The maximum usage of hired taxis is made by women belonging to SEG3.

Table 29: Modal share by socioeconomic groups and sex. Source: Primary survey

Mode	SEG1		SEG2		SEG3		All	
	Female	Male	Female	Male	Female	Male	Female	Male
Walking	57.14	22.34	46.53	11.03	14.08	11.39	41.05	14.56
Bicycle	0	6.38	0	2.21	0	0	0	2.91
Motorized two-wheeler as a driver	5.71	38.30	19.44	55.88	25.35	48.10	17.54	48.54
Motorized two-wheeler as a passenger	2.86	1.06	5.56	0.74	2.82	0	4.21	0.65
Motorized four-wheeler as a driver	0	4.25	0	8.82	11.27	20.25	2.81	10.36
Motorized four-wheeler as a passenger	2.86	0	1.39	0	7.04	1.27	3.16	0.32
Tractors	0	0	0	0.74	0	0	0	0.32
Public Transport (Bus/ Autorickshaw)	31.43	27.66	26.39	20.59	33.8	16.46	29.47	21.68

Hired taxi (Full-fare)	0	0	0.69	0	5.63	2.53	1.75	0.65
Metro	0	0	0	0	0	0	0	0
Total	100	100	100	100	100	100	100	100

Women usually prefer to walk or take public transport. Cycling is not an option they consider. This can be attributed to cultural factors such as their clothing type (Mahadevia and Advani, 2016).

Figure 15 and 16 reveal that the most commonly used mode of transport for different distance categories for men and women. It is evident that women prefer to walk for short distances and take public transport for long distances as against men who prefer driving motorized vehicles for even short distances and switch to public transport only in case of very long distances.

Figure 15: Modal share by trip length for male. Source: Primary survey. Note: MTW= Motorized Two-Wheeler; MFW= Motorized Four-Wheeler
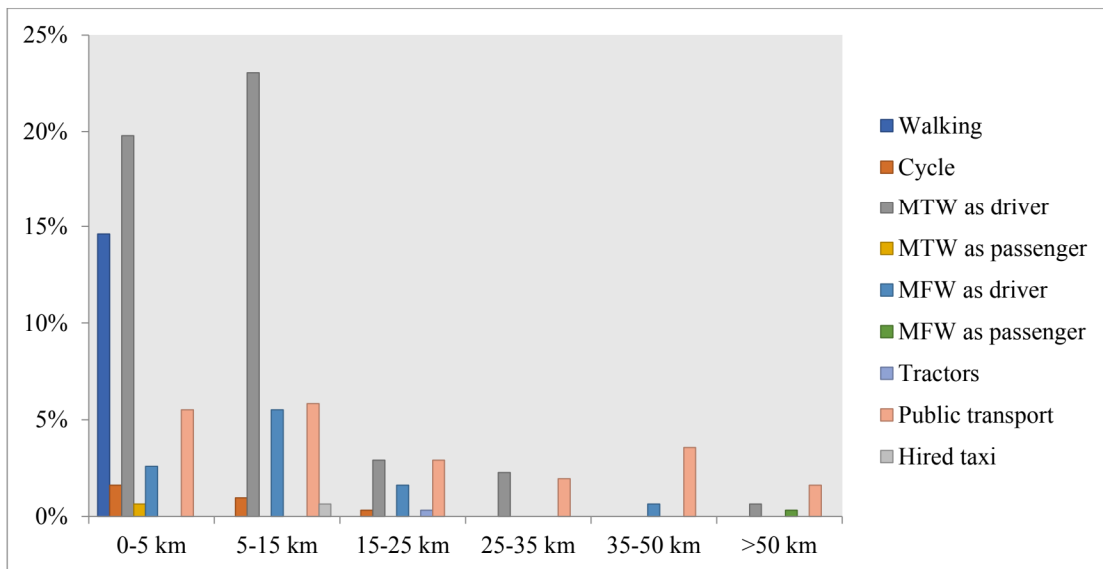
**Figure 16: Modal share by trip length for female. Source: Primary survey. Note: MTW=
Motorized Two-Wheeler; MFW= Motorized Four-Wheeler**
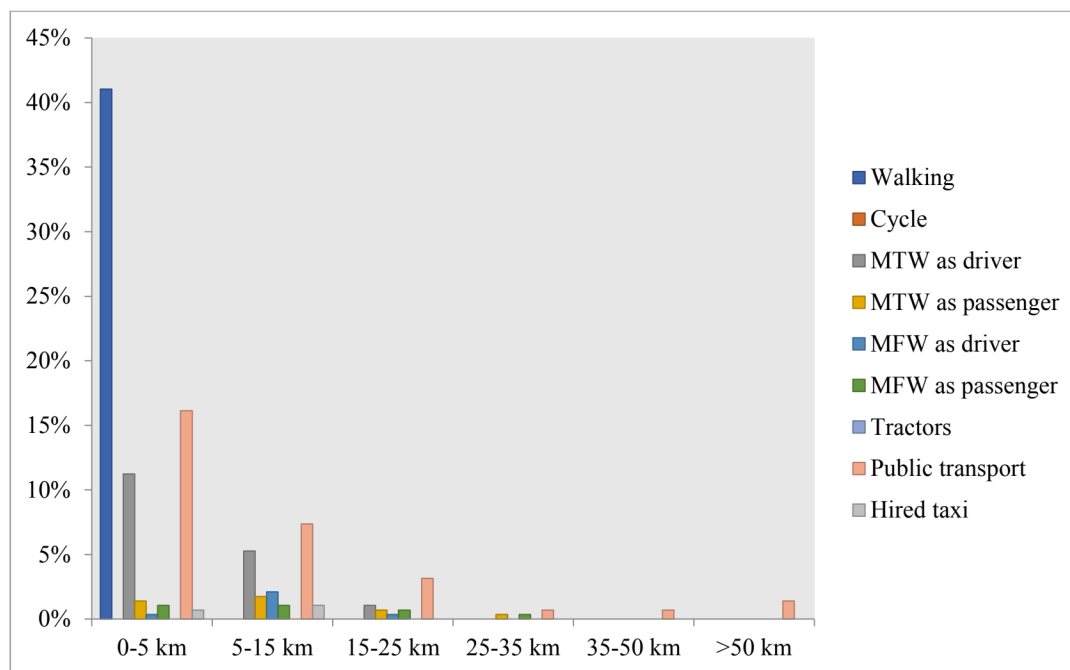
Three quarters of men made a trip to work every day as against two-fifths of women (Table

30). The other purpose for which both men and women make trip every day is involvement in

religious activities. The highest proportion of population making a daily trip for the purpose of

education is that of women belonging to SEG2.

**Table 30: Daily trips by purpose by socioeconomic groups and sex. Source: Primary
survey**

Purpose	SEG1		SEG2		SEG3		All	
	Female	Male	Female	Male	Female	Male	Female	Male
Work	40.54	71.13	37.67	80.14	45.83	71.43	40.41	75.16
Education	12.16	7.22	15.75	9.65	11.11	9.93	13.70	9.94
Health	0	0	0.68	0	0	0	0.34	0
Shopping	2.70	2.06	4.11	5.67	1.39	1.19	3.08	3.42
Pick-up/ Drop-off	4.05	13.40	9.59	12.06	8.33	4.76	7.88	10.56

Eat-out	0	1.03	0	6.38	2.78	7.14	0.69	4.97
Visiting relatives and friends	2.70	4.12	3.42	5.67	6.94	7.14	4.11	5.59
Religious activities	21.62	34.02	37.67	40.43	22.22	19.05	29.79	32.92
Sports/ recreation	1.35	1.03	2.74	0.71	2.78	4.76	2.40	1.24

4.2.2.2 Part-II

(A) Descriptive Statistics

Fig 17 displays disparities in sustainable travel mode choices of men and women. It shows how a majority of women, approximately 70 per cent, choose sustainable modes and a majority of men, approximately 60 per cent, choose unsustainable modes as the most frequent modes of travelling. A study conducted in the Chinese city of Shenyang finds that men are more likely to use non-low carbon modes for shopping than women (Li *et al.*, 2018).

Figure 17: Gender disparities in sustainable mode choice. Source: Primary survey
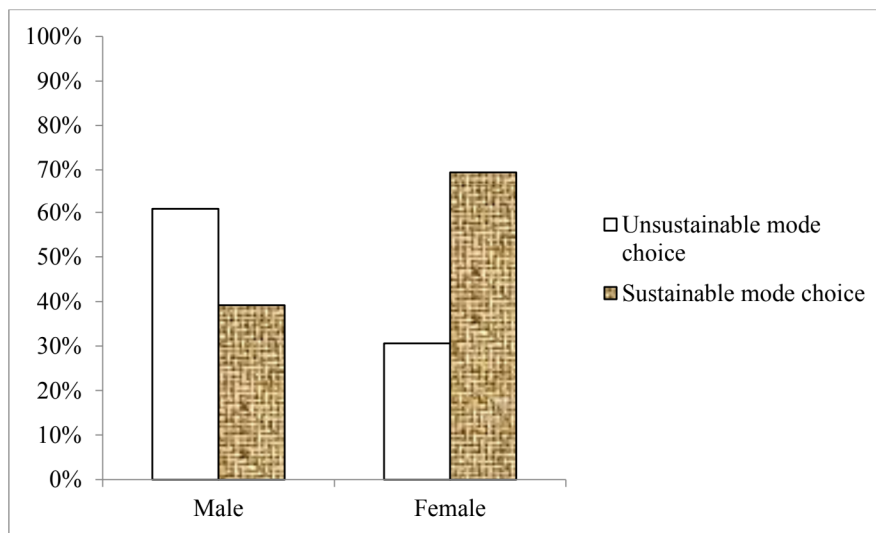
Fig. 18, 19 and 20 study disparities in sustainable mode choice segregated by various socioeconomic factors and gender. Fig. 18 shows how choice of mode of transport differs by

work status between men and women. While only 35 per cent working male use sustainable modes of transport for frequent travelling purposes, it is true for 65 per cent working women. The picture is no different for non-working population where proportion of women users of sustainable modes still surpasses that of men. In general, it is found that it is the working population which chooses more unsustainable modes for frequent travelling as compared to the non-working people, irrespective of gender.

Figure 18: Disparities in sustainable mode choice by work status and gender. Source: Primary survey
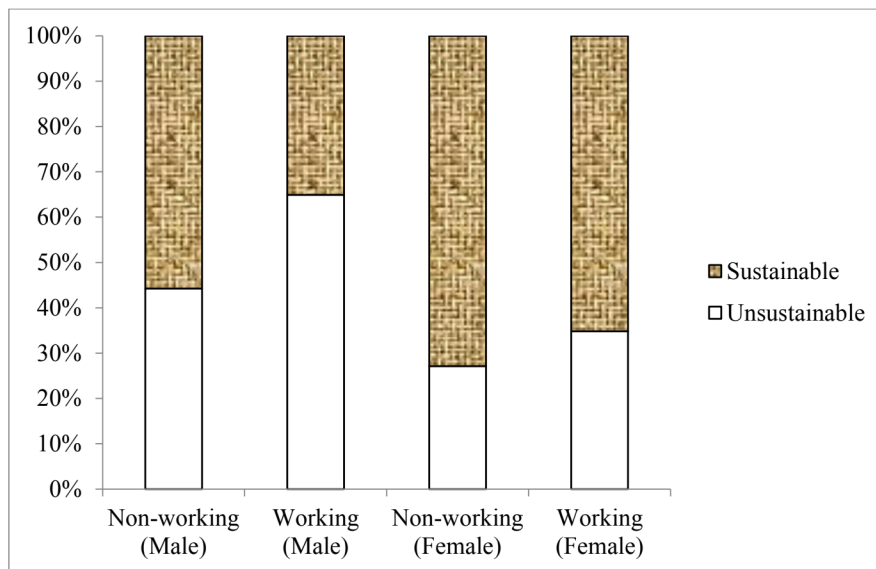
Choice of most commonly used modes of transport is also divided based upon the educational attainment of people in fig. 19. While the maximum proportion of people choosing unsustainable modes of transport includes the most educated population, the group which chooses sustainable modes the most includes the least educated. This finding defies the convention that sustainability can increase by increasing the general years of educational attainment. The proportion of women switching over from sustainable to unsustainable modes increases with increase in the years of educational attainment. However, their choice of unsustainable modes never exceeds their choice of sustainable modes, irrespective of their educational group. This is not true for men.

145

Figure 19: Disparities in sustainable mode choice by educational attainment and gender. Source: Primary survey
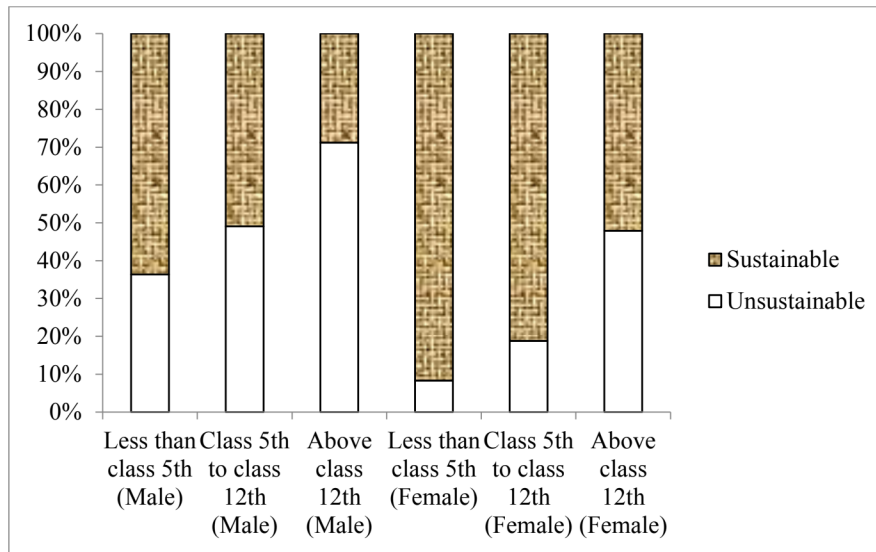
Fig 20 depicts the existing differences in modes of transport used between different categories of socioeconomic groups and between men and women. The choice of sustainable modes is substituted with the choice of unsustainable modes, as the socioeconomic status improves. It is the population of the lowest socioeconomic status which makes the most of its travel by sustainable modes. With improvement in socioeconomic status, people switch over from walking, cycling or using public transport to motorized vehicles for frequent purposes. While for men, irrespective of their socioeconomic status, the use of unsustainable modes always surpasses the use of sustainable modes, the opposite is true for women.

Figure 20: Disparities in sustainable mode choice by socioeconomic groups and gender. Source: Primary survey
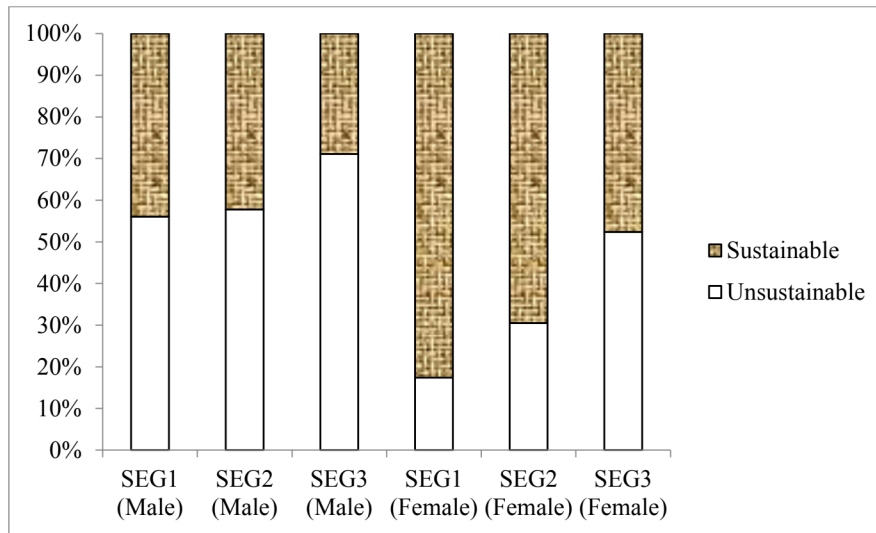
Table 31 presents a summary of sample characteristics. The sample comprised of 55 per cent male and 45 per cent female respondents, approximately. Their average age was around 32 years. The table displays the percentage of male and female respondents in each socioeconomic category. Approximately 5 per cent of data for monthly per capita consumption expenditure was missing on an average. The details of their house ownership and house type are presented in the table. Maximum proportion of population either lives in houses which are owned by them or for which they pay rent. Majority of them also reside in *pucca* houses. We notice gender disparities in the proportion of working and non-working people. While the proportion of non-working men is one-fourth of the proportion of working men, the proportion of working women is only two-thirds of the proportion of non-working women. The sample consists primarily of individuals whose educational attainment is above class 12 and the least of individuals having attained either no formal schooling or up to class 4.

Table 31: Brief summary of sample characteristics. Source: Primary survey

Characteristics	Socioeconomic category	Percentage of respondents	
		Male	Female
Monthly per capita consumption expenditure (in INR[a]):			
≤ 2500	SEG 1	29.45	19.05
2501-7000	SEG 2	43.69	33.73
>7000	SEG 3	26.86	47.22
Missing data of monthly per capita consumption expenditure		6.47	3.23
House ownership (Only of respondents with missing data): Occupied rent-free Rented Owned			
	SEG 1	10	22.22
	SEG 2	45	33.33
	SEG 3	45	44.44
House type (Only of respondents with missing data): Kutccha			
	SEG 1	0	0
Semi-pucca	SEG 2	15	22.22
Pucca	SEG 3	85	77.78
Employment status: Non-working			
	Non-working	19.74	55.56
Working	Working	80.26	44.44
Education:			
	Least educated	7.12	19.05
Less than class 5th			
	Moderately educated	35.60	33.73
Class 5th to class 12th			
	Most educated	57.28	47.22
Above class 12th			
Average age (in years)		32.4	31.9
Marital status:			

Married	Married	61.49	60.93
Others	Others	38.51	39.07
Average cost of travel (in INR)		20.04	11.55
Individuals surveyed		55.08	44.92

[a]INR is Indian Rupee, US$1~INR 71.285 as on February 2020.

(B) Logit model of sustainable mode choice

The descriptive statistics presented in the previous section depict existing relationship between travel mode choice and socioeconomic variables. An explanatory model of choice probabilities may complement the exploratory analysis.

Table 32 and 33 display the results of logit model of sustainable mode choice of men and women. This model attempts to analyze the impact of socioeconomic factors on sustainable mode choice, separately for men and women.

Table 32: Logistic regression results for impact of socioeconomic factors on sustainable mode choice of male. **Source: Primary survey**

Independent variables	Coefficient	Standard error	95% confidence interval	
			Lower	Upper
Work status (ref: non-working)	-1.149***	0.363	-1.861	-0.437
Education: Less than class 5th (ref: Above class 12th)	1.567 ***	0.505	0.577	2.557
Education: Class 5th to class 12th (ref: Above class 12th)	1.194***	0.286	0.634	1.755
Socioeconomic group: SEG1 (ref: SEG3)	0.710**	0.357	0.010	1.410
Socioeconomic group: SEG2 (ref: SEG3)	0.664**	0.337	0.004	1.324
Age	-0.013	0.014	-0.040	0.014
Marital status (ref: other)	-0.138	0.344	-0.812	0.537
Cost of travel	-0.007	0.006	-0.018	0.005
Constant	0.013	0.444	-0.859	0.884

Pseudo R-squared	0.107
Log likelihood	-184.718
Chi-Square	44.28
Per cent correctly predicted	68.93%
Hosmer-Lemeshow Prob > Chi-Square	0.172

*** p < 0.01; ** p < 0.05; * p < 0.1.

The reference category for work status in our model is non-working. Working men have 68 per cent lower odds of choosing a sustainable mode of transport than non-working men. Working women, on the other hand, have 41 per cent lower odds of choosing a sustainable mode of transport than non-working women. One possible explanation why working people are less likely to choose sustainable modes of transport for frequent travelling purposes is the psychology of choosing more convenient and time-saving modes.

Table 33: Logistic regression results for impact of socioeconomic factors on sustainable mode choice of female. **Source: Primary survey**

Independent variables	Coefficient	Standard error	95% confidence interval	
			Lower	Upper
Work status (ref: non-working)	-0.528	0.323	-1.160	0.104
Education: Less than class 5th (ref: Above class 12th)	2.628***	0.668	1.318	3.937
Education: Class 5th to class 12th (ref: Above class 12th)	1.442***	0.403	0.652	2.232
Socioeconomic group: SEG1 (ref: SEG3)	0.801	0.495	-0.171	1.773
Socioeconomic group: SEG2 (ref: SEG3)	0.259	0.359	-0.445	0.963
Age	-0.009	0.018	-0.045	0.026
Marital status (ref: other)	-1.119***	0.392	-1.887	-0.351
Cost of travel	-0.047***	0.010	-0.066	-0.028

150

Constant	1.615***	0.558	0.521	2.709
Pseudo R-squared	0.244			
Log likelihood	-129.043			
Chi-Square	83.28			
Per cent correctly predicted	72.76%			
Hosmer-Lemeshow Prob > Chi-Square	0.940			

*** p < 0.01; ** p < 0.05; * p < 0.1.

Educational attainment is one variable which has a significant impact on choice of sustainable travel mode for both men and women. Men having no formal education or having studied till class 4, have more than four times the odds of choosing a sustainable mode of transport for frequent purposes than those having attained education above class 12. Similarly, those of them having attained education between class 5 and class 12, have three times the odds of opting for a sustainable mode than those having attained education above class 12. The same is true for women where the least educated have fourteen times the odds of choosing a sustainable mode and those having attained education between class 5 and class 12 have four times the odds of choosing a sustainable mode than those having the highest education. This indicates that the most educated are the least likely to choose a sustainable mode. Simple increase in the years of schooling has less to do with concern and attitude towards environment. In fact, as the years of educational attainment increase, the concern for environment is likely to fall. This can be because more educated people are more likely to be working and working individuals tend to be using faster modes of transport which helps save time. Also, because curriculum of schooling in the region has less to with awareness and concern for environment. Existing literature on the issue depicts contradictory findings. While a study conducted in Nigeria concludes that well educated people prefer private mode of travel (Nkeki and Asikhia, 2019), other study conducted in United States finds the walking and cycling rates to be highest among well-educated population (Buehler *et al.*, 2020).

Men in low and medium socioeconomic groups have two times the odds of choosing a sustainable mode of transport for frequent travelling than men in high socioeconomic group. Similarly, women in low and medium socioeconomic groups have 2.2 and 1.3 times the odds of opting for a sustainable mode, respectively than women in high socioeconomic group. Improvement in socioeconomic status is linked with lower odds of choosing sustainable modes, and implicitly lower odds of concern for environment. This behavior can be attributed to higher levels of affordability among individuals in higher socioeconomic groups. With greater affordability comes greater willingness to ride owned, faster and more-convenient motorized modes. It is in accordance with the findings of Mahadevia and Advani (2016) but in contrast with that of (Li *et al.*, 2018). The study by Mahadevia and Advani (2016) finds that as the socioeconomic status improves, the use of non-motorized means of transport, like walking and cycling, and the use of public transport, reduces by both men and women in Rajkot. The study by Li *et al.* (2018) finds that lower income residents are more likely to choose non-low carbon modes while making shopping trips in China.

Age does not display a significant relationship with mode choice. An increase in age of both men and women by one year is reported to reduce their odds of choosing a sustainable mode by 1 per cent. The odds of choosing a sustainable mode are approximately 13 per cent lower for married men than for men in the 'other' category. Similarly, the odds of married women making the same choice is 67 per cent significantly lower than women in the 'other' category. While increase in cost of travel by a rupee decreases the odds of sustainable mode choice by 0.7 per cent for men, it reduces significantly by 4.6 per cent for women.

4.2.2.3 Part-III

(A) Descriptive Statistics

This section examines the choice of mode of transport for non-work related activities in a developing country city. Through fig. 21, the most travelled for and the least travelled for non-work activities are highlighted. It shows the percentage of total population which travels for each of the activities. Because education is one activity which is travelled for by a specific age group of population, it is that activity which is travelled for by the lowest number of people. One activity for which majority of the population, approximately four-fifths, travels is shopping. Other than shopping, major portion of the population also travels for religious activities and for visiting friends and relatives.

Fig. 21: Percentage of total population travelling for different non-work related purposes. Source: Primary survey
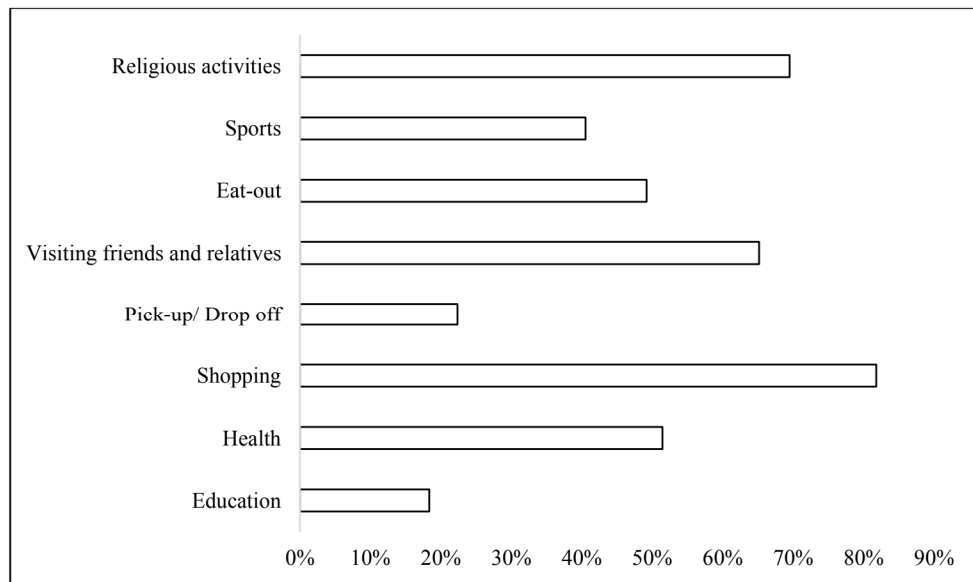
The share of more-polluting modes of transport is more than the share of less-polluting modes of transport in the total vehicle use in the city. While approximately 56 per cent of the population uses the more-polluting modes, the usage of less-polluting modes is only limited to 44 per cent. Choice of the type of mode of transport is further classified on the basis of different

socio-demographic factors. Fig. 22 divides the total usage of both less-polluting and more-polluting modes on the basis of gender. Men are not only the dominant users of all kinds of transportation vehicles but also of the ones which are more-polluting. Out of women's total usage of transportation facilities, they use more of the less-polluting modes and less of the more-polluting modes.

Fig. 22: Gender-wise distribution of choice of mode of transport. Source: Primary survey
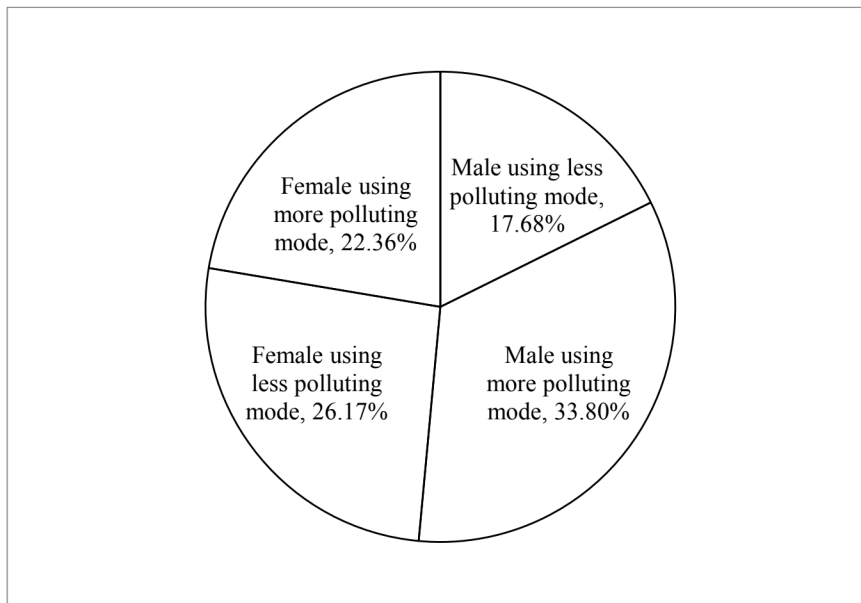
Overall, the major users of transportation vehicles are those in the age group of 26-39 years (fig. 23). This age group also is the dominant user of more-polluting modes. The difference between use of more-polluting modes and less-polluting modes is highest among the same group. Population in the age of 18-25 years is the only group where the use of less-polluting modes exceeds the use of more-polluting modes, though fairly. This youngest age group also comprises of the highest number of individuals using less-polluting modes.

Fig. 23: Distribution of choice of mode of transport among various age groups. Source: Primary survey
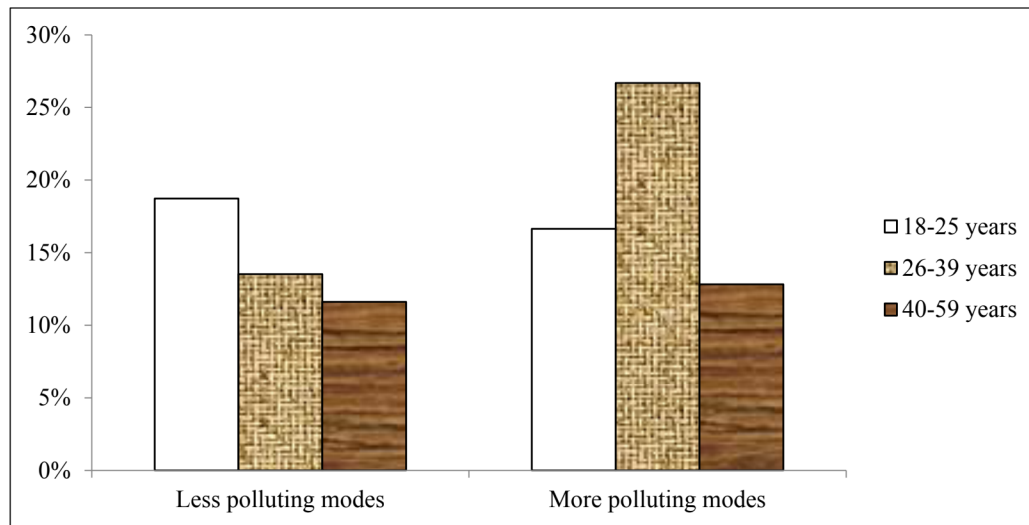
Because the population comprises of a large number of individuals belonging to the middle-class socio-economic status, they are also the ones who are the overall highest users of both or any kind of transport. However, taking a look at the intra-class differences in the usage of the two types of modes, as shown in fig. 24, it is evident that the highest differences exist in population belonging to SEG2 with more people preferring to use more-polluting modes. It is only the individuals belonging to the lower socio-economic status who use more less-polluting modes than more-polluting modes. With an improvement in socio-economic status, the usage of more-polluting modes is found to increase, though not in constantly rising proportions.

Fig. 24: Distribution of choice of mode of transport among different socioeconomic groups. Source: Primary survey
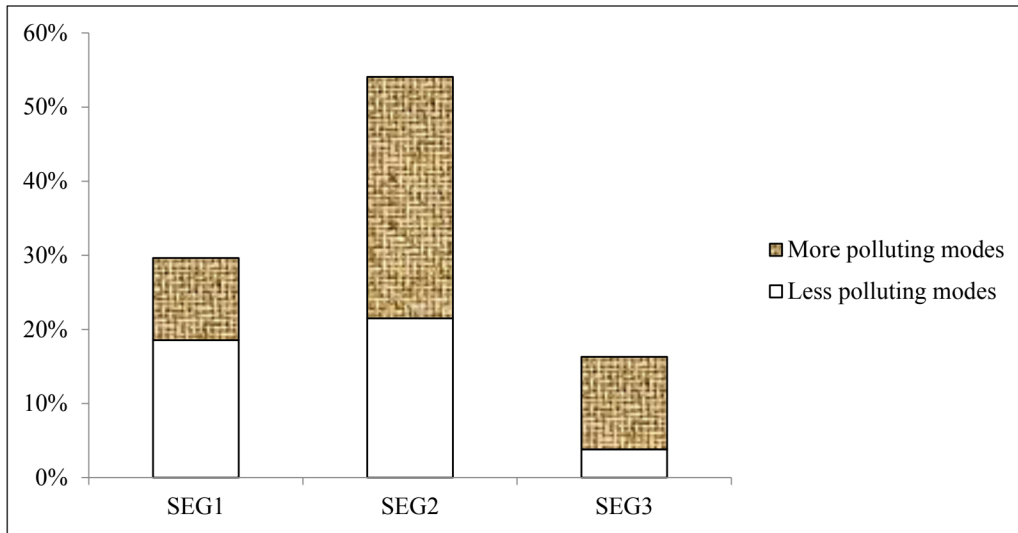
More than half the individuals in the sample are those who have studied at least till class 12th. Clearly their usage of transportation facilities is the highest among all other individuals, as shown in fig. 25. Surprisingly, with an improvement in the years of schooling, the difference between the two types of modes is found to decline. In fact, the most educated group comprises of the highest proportion of individuals who forego less-polluting modes to use the more-polluting ones. It is only this group whose usage of more-polluting modes exceeds that of less-polluting modes.

Fig. 25: Distribution of choice of mode of transport among different groups of educational attainment. Source: Primary survey
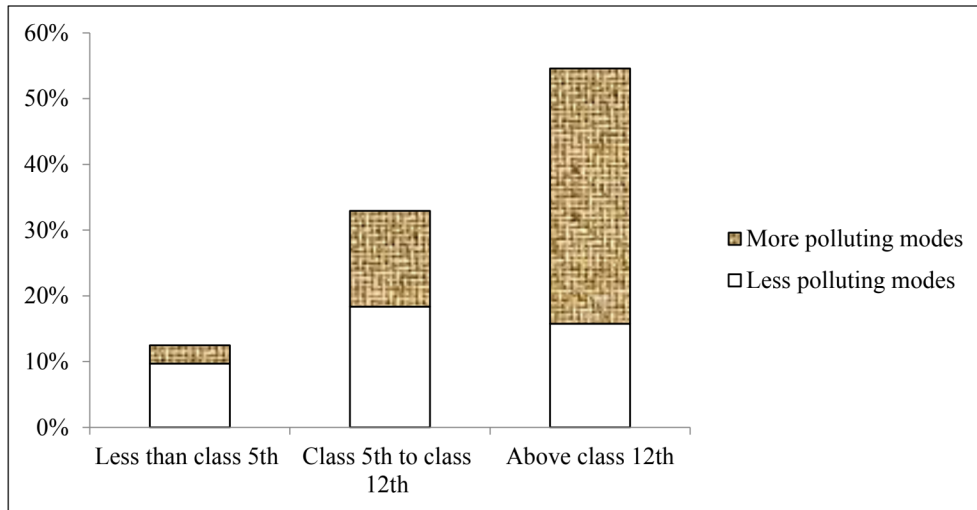
Fig. 26 shows that the studied sample comprises three-fifths of working individuals and two-fifths of non-working individuals. From this perspective, it is the group of working people whose usage of more-polluting modes exceeds the usage of less-polluting modes by a heavy amount. The non-working individuals, on the other hand, almost equally use both kinds of modes.

Fig. 26: Distribution of choice of mode of transport based on work status. Source: Primary survey

Table 34 shows the different non-work purposes for which different segments of population travel. Shopping is one purpose for which the highest proportions of individuals travel, irrespective of any socio-demographic changes existing between them. The purpose for which the lowest numbers of men travel is education and that for which women travel is picking-up or dropping-off someone. The purpose for which percentage of women travelers exceeds the percentage of male travelers includes education and shopping. With an improvement in socioeconomic status, the proportion of population travelling for most of the purposes is found to increase. The proportion of working individuals travelling for almost all of the purposes is higher than the proportion of non-working individuals. With an enhancement in the years of schooling, the proportion of population travelling for certain purposes is found to increase tremendously. These include purposes of education and leisure activities such as eating out, visiting friends and relatives and travelling for sports or recreational activities. A large chunk of population which travels for education includes individuals belonging to the age group of 18-25 years. As age increases, while travel for certain leisure activities like eating out or

recreation is found to decrease, the travel for purposes such as health and religious activities is found to increase.

Table 34: Percentage of total population traveling for different non-work related purposes by socio-demographic characteristics. Source: Primary survey

Socio-demographic factors	Education	Health	Shopping	Pick-up/Drop-off	Eat-out	Visiting friends and relatives	Religious activities	Sports/recreation
Sex: Male Female	 15.49 21.43	 56.90 45.71	 79.80 83.93	 30.30 13.93	 54.21 43.93	 71.04 58.93	 70.37 68.57	 42.09 38.93
Socioeconomic status: SEG1 SEG2 SEG3	 13.45 20.19 21.28	 49.71 57.69 34.04	 83.04 81.41 80.85	 18.71 23.72 24.47	 45.61 46.50 63.83	 60.82 66.67 68.09	 63.16 72.12 72.34	 36.84 39.74 50.00
Employment status: Non-working Working	 46.61 0.84	 48.87 53.09	 77.83 84.27	 22.62 22.19	 45.70 51.40	 59.73 68.54	 60.18 75.28	 40.27 40.73
Education: < class 5th Class 5th- 12th > class12th	 0.00 6.84 29.21	 58.33 55.26 47.62	 77.78 80.00 83.81	 6.94 25.79 23.81	 15.28 28.42 69.52	 51.39 58.42 72.38	 68.06 76.84 65.40	 8.33 18.42 61.27
Age groups: 18-25 years 26-39 years 40-59 years	 48.04 3.44 0.00	 44.61 53.88 57.45	 77.45 87.93 78.01	 23.53 24.57 17.02	 58.33 53.02 29.79	 66.67 67.24 59.57	 59.80 72.41 78.72	 51.96 47.41 12.77

Table 35 presents a summary of sample characteristics. The sample consists of 51 per cent men and 49 per cent women, approximately. The age groups into which the individuals in this study have been divided comprises of 35 per cent individuals belonging to the youngest group of 18-25 years, 40 per cent individuals lying in the age group of 26-39 years and approximately 25 per cent individuals belonging to the eldest category of 40-59 years. Majority of the population in our sample is of working people. Those who have not attained any formal schooling or those

having attained only primary education are approximately 12 per cent of individuals. 33 per cent of individuals in the sample are those individuals who have studied between class 5th and class 12th. More than half the population of the sample is of those individuals who have studied at least till 12th. The table also displays the percentage of individuals belonging to different socioeconomic groups based on their monthly per capita consumption expenditure. For the 5 per cent missing data of consumption expenditure, this study uses the data for house ownership and house type to categorize the individuals into different socio-economic categories.

Table 35: Brief summary of sample characteristics. Source: Primary survey

Characteristics	Percentage of respondents
Sex:	
Male	51.47
Female	48.53
Monthly per capita consumption expenditure (in INR[1]):	
≤ 2500	28.78
2501-7000	54.83
>7000	16.39
Missing data of monthly per capita consumption expenditure	4.85
House ownership (Only of respondents with missing data):	
Occupied rent-free	14.28
Rented	39.29
Owned	46.43
House type (Only of respondents with missing data):	
Kutccha	0
Semi-pucca	82.14
Pucca	17.86
Employment status:	
Non-working	38.30
Working	61.70
Education:	
Less than class 5th	12.48
Class 5th to class 12th	32.93
Above class 12th	54.59
Age groups:	
18-25 years	35.36
26-39 years	40.20
40-59 years	24.44
Average cost of travel for non-work purposes (INR[1])	10.14
Individuals surveyed (Number)	577

---

[1] INR is Indian Rupee, US$1~INR 71.285 as on February 2020.

(B) Logit model of choice of less-polluting modes of transport

The descriptive statistics presented in the previous section depict existing relationship between travel mode choice and socio- demographic variables. An explanatory model of choice probabilities may complement the exploratory analysis.

Table 36 shows the results of logit model of less-polluting mode choice. This model attempts to analyze the impact of socio-demographic factors on less-polluting mode choice for purposes other than work.

Table 36: Logistic regression results for impact of socio-demographic factors on choice of less polluting modes of transport for non-work related activities. Source: Primary survey

Independent variables	Coefficient	Standard error	95% confidence interval	
			Lower	Upper
Sex (ref: male)	1.011***[2]	0.231	0.559	1.463
Age: 18-25 years (ref: 40-59 years)	0.765***	0.288	0.200	1.330
Age: 26-39 years (ref: 40-59 years)	-0.671**	0.265	-1.191	-0.152
Education: Less than class 5th (ref: Above class 12th)	2.359***	0.352	1.669	3.049
Education: Class 5th to class 12th (ref: Above class 12th)	1.292***	0.229	0.843	1.741
Work status (ref: non-working)	-0.058	0.235	-0.520	0.403
Socioeconomic group: SEG1 (ref: SEG3)	1.689***	0.339	1.025	2.354
Socioeconomic group: SEG2 (ref: SEG3)	0.580*	0.301	-0.011	1.171
Cost of travel	0.001	0.010	-0.019	0.021
Constant	-2.324***	0.435	-3.176	-1.471
Pseudo R-squared	0.213			
Log likelihood	-311.388			
Chi-Square	168.36			
Per cent correctly predicted	71.75%			
Hosmer-Lemeshow Prob > Chi-Square	0.745			
Sample size	577			

---

[2] *** p < 0.01; ** p < 0.01; * p < 0.05.

The reference category for sex is male. The results of logit model indicate that women have significantly higher odds of choosing less-polluting modes to travel for non-work purposes than men, more than twice.

Age has a significant impact on mode choice. To travel for purposes other than work, while the youngest age group has almost twice the odds of choosing a less-polluting mode than the eldest age group, those in the age group of 26-39 years have 49 per cent lower odds of choosing the same as compared to those in the age group of 40-59 years. This implies that while the age group of individuals belonging to 26-39 years chooses the most polluting modes as compared to other age groups, those in youngest age group are the most likely to choose less-polluting modes.

The least educated individuals have the highest odds of choosing a less polluting mode as compared to the other educational groups. As the years of education attained rise, the odds of choosing less-polluting mode significantly declines. The ones belonging to the highest educated group have the least concern for environment and are the most likely to choose a more-polluting mode for purposes other work.

The working individuals have approximately 6 per cent lower odds of choosing a less-polluting mode of transport for purposes other than work, as compared to the non-working individuals.

Another significant socio-demographic factor considered in the study is the socio-economic status to which individuals in the sample belong to. SEG1 denotes individuals with the lowest socioeconomic status. These individuals have more than five times the odds of choosing a less-polluting mode for non-work purposes as compared to those individuals who belong the highest socioeconomic category. The individuals belonging to SEG2 have approximately twice the odds of choosing a less-polluting mode. Therefore, it is evident that as the socioeconomic status

of individuals is found to improve, their odds of choosing a less-polluting mode to travel for purposes other than work are found to decline.

Cost of travel, which is taken as a control variable of the study, though does not have a significant influence on choice of mode of transport but its coefficient indicates that a unit increase in cost of travel for purposes other than work, increases the odds of choosing a less polluting mode for these purposes by 0.1 per cent.

4.2.3 Section -III

This section of the chapter illustrates analysis of the third objective of our thesis. This section has been partitioned into two parts. The first part outlines the gap in travel behavior based on gender and then proposes policy suggestions for gender-sensitive transport planning and the opinion of public on these proposed measures. The second part of this section aims to understand the role of threat to safety in trading-off public transport with private modes.

4.2.3.1 Part-I

Results and Discussion

Figures 27-30 depict gender differences in different measures of travel behavior. 89 per cent of male as against 66 per cent of female travel frequently (figure 27). Majority of the men travel long distances as against majority of the women who travel short distances (figure 28). 59 per cent men use motorized modes of transport as against only 30 per cent women (figure 29). While men who travel for work purposes are four-fifths of the entire population, women who travel for the same are only two-fifths (figure 30).

Figure 27: Gender differences in frequency of travelling. Source: Primary survey
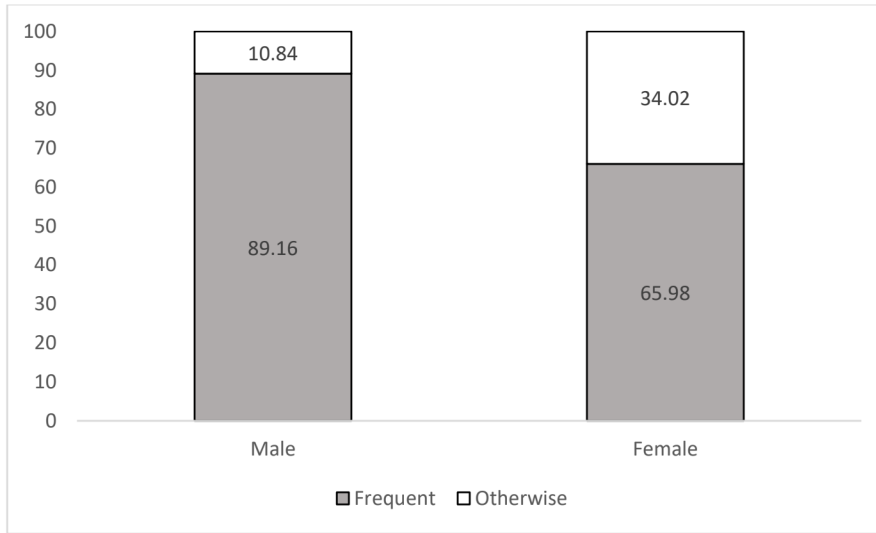
Figure 28: Gender differences in distance travelled. Source: Primary survey
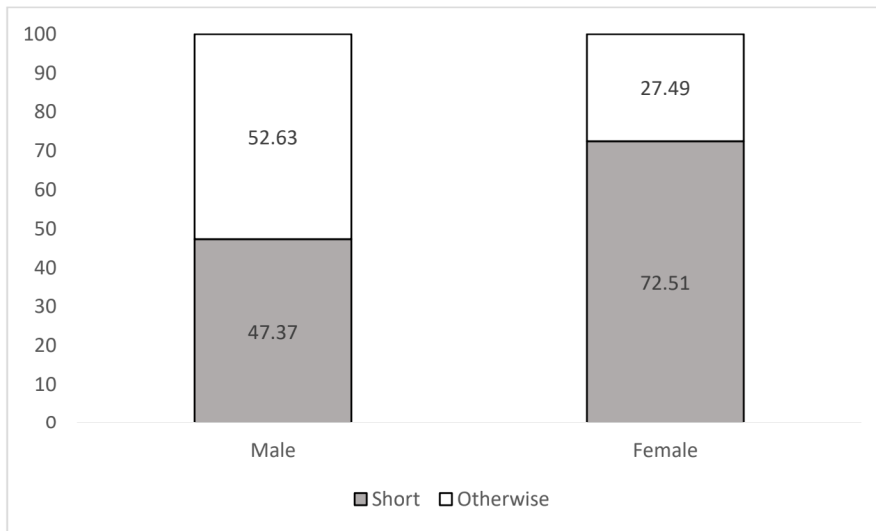
Figure 29: Gender-wise distribution of type of mode of transport used. Source: Primary survey
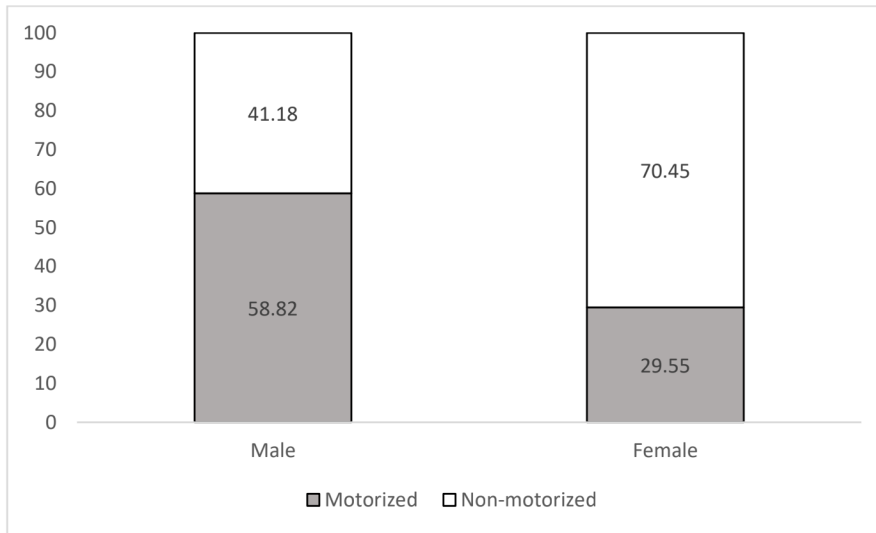

Figure 30: Gender differences in purpose of travelling. Source: Primary survey
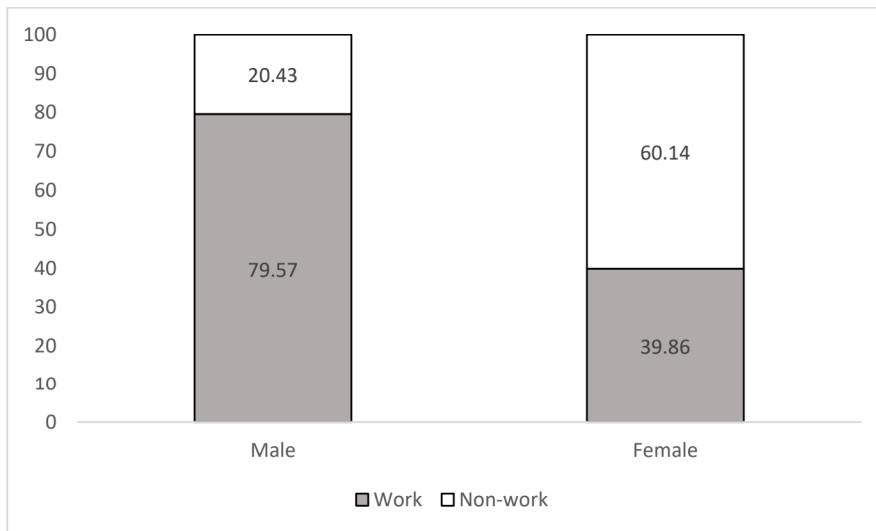

Table 37 gives a brief overview of the data employed in the study. With values indicating the percentage of respondents in each category, it briefly introduces each variable employed in the study.

Table 37: Brief summary of sample characteristics. Source: Primary survey

Characteristics		Percentage of respondents
Mode of transport used	Non-motorized	55.05
	Motorized	44.95
Distance travelled	Short	59.28
	Otherwise	40.72
Sex	Female	47.39
	Male	52.61
Cost of travelling	No cost	32.57
	Low cost	43.98
	High cost	23.45
Frequency of travelling	Frequent	78.18
	Otherwise	21.82
Purpose of travelling	Work	60.75
	Non-work	39.25
Monthly per capita consumption expenditure (in INR[a]):	≤ 2500	28.45
	2501-7000	47.41
	>7000	24.14
Missing data of monthly per capita consumption expenditure		5.54
House ownership (Only of respondents with missing data):	Occupied rent-free	7.33
	Rented	34.53
	Owned	58.14
House type (Only of respondents with missing data):	Kutccha	0.65
	Semi-pucca	11.40
	Pucca	87.95
Socioeconomic groups (SEG)	SEG1	27.85
	SEG2	46.74
	SEG3	25.41

[a]INR is Indian Rupee, US$1~INR 71.285 as on February 2020.

Prior to fitting the probit model, the study first confirms existence of any relationship between the explained and the explanatory variables. For this, as seen in table 38, a chi-square test is performed. The results of this test indicate that all the explanatory variables, viz., sex of the respondent, cost of travelling, frequency of travelling, purpose of travelling and socioeconomic status, are found to be associated with choice of type of mode of transport. Individual's sex, cost of travelling incurred, the purpose for which one travels and their socioeconomic status is found to be to associated with distance travelled. Frequency of travelling, however, is found to

be not associate with distance travelled. Another explanatory variable, number of motorized vehicles owned, is a continuous variable. For this reason, point biserial correlation is run to test the association between the categorical outcome and continuous independent variable. This test shows that this independent variable is significantly associated with both the explained variables (table 39).

Table 38: Chi- square test of association between outcome and each independent variable. Source: Primary survey

Explanatory variable	Distance travelled		Mode of travel	
	Chi-square	p value	Chi-square	p value
Sex	40.083	0.000***	53.001	0.000***
Cost	295.173	0.000***	198.023	0.000***
Frequency of travelling	1.702	0.192	12.827	0.000***
Purpose of travelling	17.866	0.000***	36.437	0.000***
SEG	4.968	0.083*	35.753	0.000***

Note: *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 39: Point biserial correlation between categorical outcome and continuous independent variable. Source: Primary survey

Explanatory variable	Distance travelled		Mode of travel	
	Coefficient	p value	Coefficient	p value
Number of motorized two-wheelers owned	-0.114	0.005***	-0.313	0.000***

Note: *** $p<0.01$, ** $p<0.05$, * $p<0.1$

To study the influence of each independent variable on the dependent variables, we run two separate univariate probit regressions. Table 40 shows the results of univariate probit model for distance category covered. While the chi square test of association represented that all explanatory variables other than frequency of travelling are associated with this explained variable, the results of univariate probit model display a different picture. Only sex of the respondent and cost of travelling incurred are found to significantly impact the decision of

167

distance to be covered. In a similar fashion, table 41 exhibits the results of univariate probit model for choice of type of mode of transport. The test results of chi square test of association indicated that all the independent variables were significantly related with this dependent variable. However, the results of univariate probit model find that all the explanatory variables, except frequency of travelling and distance travelled, significantly impact the choice of type of mode of transport. The results hint at the significant impact of gender on both choice of distance covered and choice of type of mode of transport, whether fitted alone or along with other variables.

Table 40: Univariate probit model for distance travelled. Source: Primary survey

Explanatory variable	Coefficient
Sex (ref: male)	-0.409***
	(0.146)
Cost of travelling: no cost (ref: high cost)	3.563***
	(0.295)
Cost of travelling: low cost (ref: high cost)	2.489***
	(0.267)
Number of motorized two-wheelers owned	-0.024
	(0.076)
Frequency of travelling (ref: otherwise)	-0.162
	(0.226)
Purpose of travelling (ref: non-work)	-0.101
	(0.176)
Socioeconomic group: SEG1 (ref: SEG3)	-0.182
	(0.186)
Socioeconomic group: SEG2 (ref: SEG3)	0.103
	(0.160)
Constant	-1.643***
	(0.304)
Pseudo R-squared	0.446
LR chi-square	370.69
Per cent correctly predicted	78.50
Area under ROC curve	0.8916
Observations	614

Note: *** $p<0.01$, ** $p<0.05$, * $p<0.1$. Standard errors in parentheses.

Table 41: Univariate probit model for mode of transport used. Source: Primary survey

Explanatory variable	Coefficient
Sex (ref: male)	
	-0.521***
	(0.138)
Cost of travelling: no cost (ref: high cost)	
	1.997***
	(0.237)
Cost of travelling: low cost (ref: high cost)	
	0.422**
	(0.179)
Number of motorized two-wheelers owned	
	-0.441***
	(0.067)
Frequency of travelling (ref: otherwise)	
	-0.089
	(0.195)
Purpose of travelling (ref: non-work)	
	-0.452***
	(0.166)
Socioeconomic group: SEG1 (ref: SEG3)	
	0.726***
	(0.175)
Socioeconomic group: SEG2 (ref: SEG3)	
	0.318**
	(0.149)
Distance travelled (ref: otherwise)	-0.061
	(0.160)
Constant	
	0.227
	(0.215)
Pseudo R-squared	0.376
LR chi-square	318.13
Per cent correctly predicted	80.94
Area under ROC curve	0.8861
Observations	614

Note: *** $p<0.01$, ** $p<0.05$, * $p<0.1$. Standard errors in parentheses.

Table 42 depicts the results of bivariate probit model for distance category travelled and mode

of transport chosen. The results of this analysis bring to notice that all the variables, excluding

frequency of travelling. significantly affect the choice of distance travelled and mode used. Values of average marginal effects calculated for both the response variables indicate that men have approximately 41 per cent lower chance of travelling short distances and about 52 per cent lower chance of opting for a non-motorized mode of transport as compared to women. Individuals travelling at low and zero cost of travelling have higher chances of travelling short distances and opting for non-motorized modes than the ones travelling at high cost. The results from this model also indicate that with increases in ownership of number of motorized two-wheelers, the chances of opting for a non-motorized mode decrease. Individuals travelling for work purposes 45 per cent lower chances of choosing a non-motorized mode for travelling. With improvement in socioeconomic status of individuals, their chances of choosing a non-motorized mode decline.

Table 42: Bivariate probit model for distance travelled and mode of transport used. Source: Primary survey

Outcome variable	Explanatory variable	Coefficient	Marginal effects
Distance travelled (1= short, 0= otherwise)	Sex (ref: female)	-0.409*** (0.146)	-0.409
	Cost of travelling: no cost (ref: high cost)	3.563*** (0.296)	3.563
	Cost of travelling: low cost (ref: high cost)	2.489*** (0.267)	2.489
	Number of motorized two-wheelers owned	-0.441*** (0.067)	-0.024
	Frequency of travelling (ref: otherwise)	-0.085 (0.194)	-0.162
	Purpose of travelling (ref: non-work)	-0.453*** (0.166)	-0.101
	Socioeconomic group: SEG1 (ref: SEG3)	0.729*** (0.175)	-0.182
	Socioeconomic group: SEG2 (ref: SEG3)	0.315** (0.149)	0.103
	Constant	0.220 (0.214)	-1.643
	Observations	614	
Mode of transport used (1=	Sex (ref: female)	-0.517*** (0.138)	-0.517
	Cost of travelling: no cost (ref: high cost)	1.950***	1.950

non-motorized mode, 0= motorized mode)		(0.203)	
	Cost of travelling: low cost (ref: high cost)	0.384*** (0.148)	0.384
	Number of motorized two-wheelers owned	-0.441*** (0.067)	-0.441
	Frequency of travelling (ref: otherwise)	-0.085 (0.194)	-0.085
	Purpose of travelling (ref: non-work)	-0.453*** (0.166)	-0.453
	Socioeconomic group: SEG1 (ref: SEG3)	0.729*** (0.175)	0.729
	Socioeconomic group: SEG2 (ref: SEG3)	0.315** (0.149)	0.315
	Constant	0.220 (0.214)	0.220
	Observations	614	
Rho		0.004 (0.089)	

Note: *** $p<0.01$, ** $p<0.05$, * $p<0.1$. Standard errors in parentheses.

The overall fit of the model is tested using the Wald test, where Wald chi2(18) = 351.21 and p-value is 0.0000, depicting that the model is significant. The model is also tested for the presence of correlation, where the likelihood ratio test, however, does not reject the null hypothesis of zero correlation between the two outcome variables with chi2(1) = 0.001848 and p-value = 0.966. This implies that the correlation between distance travelled and mode used is insignificant. We, however, continue with fitting the seemingly unrelated bivariate probit model.

Table 43 depicts the results of seemingly unrelated bivariate probit model. In this model, only those variables are included which give the most significant results when analyzed together. The results indicate that sex of respondent and cost of travelling have a significant impact on choice of distance category covered, and individual's sex, cost of travelling incurred, number of motorized two-wheelers owned, purpose of travelling, socioeconomic status of individuals and distance covered significantly influence the choice of type of mode of transport. The results of average marginal effects report that men have lower chance of travelling short distance and

opting for non-motorized modes of transport. Other results indicate that those incurring low cost of travelling have lower chances of travelling short distances or choosing non-motorized vehicles, as compared to those incurring high costs. As the number of motorized two-wheelers owned rises, the chance of using non-motorized vehicles sees a fall. Respondents travelling for work purposes have lower chance of using non-motorized vehicles. As the socioeconomic status is found to improve, the chance of using non-motorized vehicles declines. Individuals travelling short distances have 0.5 per cent lower chance of opting for a non-motorized mode as compared to individuals travelling long distances.

Table 43: Seemingly unrelated bivariate probit model for mode of transport used and distance travelled. Source: Primary survey

| Outcome variable	Explanatory variable	Coefficient	Marginal effects
Distance travelled (1= short, 0= otherwise)	Sex (ref: female)	-0.388*** (0.142)	-0.0000969
	Cost of travelling: no cost (ref: high cost)	3.488*** (0.291)	0.428
	Cost of travelling: low cost (ref: high cost)	2.240*** (0.243)	0.076
	Constant	-1.670*** (0.288)	
	Observations	614	
Mode of transport used (1= non-motorized mode, 0= motorized mode)	Sex (ref: female)	-0.590*** (0.122)	-0.004
	Cost of travelling: no cost (ref: high cost)	3.086*** (0.204)	0.688
	Cost of travelling: low cost (ref: high cost)	1.433*** (0.181)	0.121
	Number of motorized two-wheelers owned	-0.352*** (0.069)	-0.005
	Purpose of travelling (ref: non-work)	-0.422*** (0.148)	-0.004
	Socioeconomic group: SEG1 (ref: SEG3)	0.537*** (0.163)	0.0 16
	Socioeconomic group: SEG2 (ref: SEG3)	0.225** (0.133)	0.004
	Distance travelled (ref: otherwise)	-1.546*** (0.148)	-0.005
	Constant	0.211 (0.203)	

	Observations	614
Rho		1.813**
		(0.815)

The overall fit of the model is tested using the Wald test which gives Wald chi2(12) = 466.25 and p-value=0.0000, implying that the model is significant. The likelihood ratio test rejects the null hypothesis of zero correlation between usage of public transport and the reason for not preferring it over private transport (chi2(1) = 7.015 and p-value = 0.008).

The above analysis does confirm the influence of gender on various measures of travel pattern. These findings are in accordance with the observations of Anand andTiwari (2007); Mahadevia and Advani (2016); Srinivasan and Rogers (2005) but do not support the hypothesis proposed by Korzhenevych and Jain (2018) and Tilley and Houston (2016). Because gender affects the various choices related to travelling, a deviation is observed between men and women over both choice of type of mode of transport used and how far one travels. For this reason, during the survey, a set of questions were put up to the respondents which record their response to certain policy changes which hint at bridging the gender gap.

Figure 31 shows preference for women-only public transport. While women were asked if they would prefer a women-specific transport over a common one, men were asked if they prefer the same for female in their family. Majority of the individuals responded in favor of women-only public modes.

Figure 31: Preference for women-only public transport. Source: Primary survey
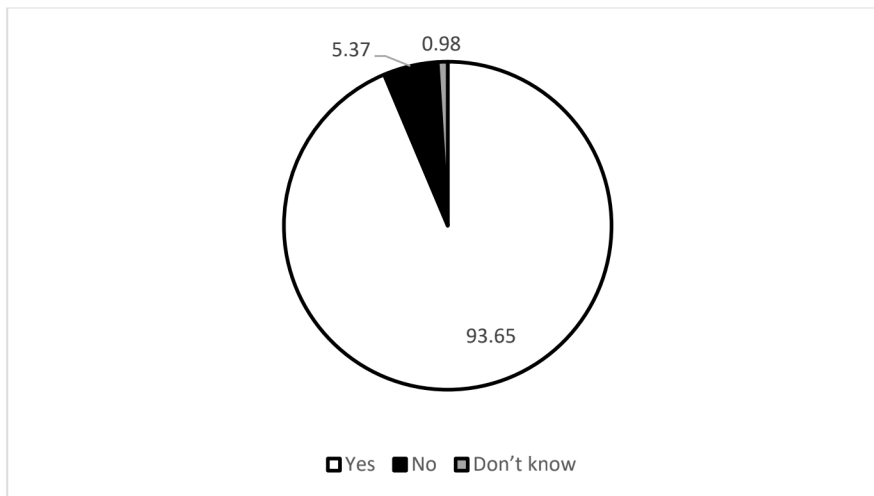
We then ask who should be the driver of these women-specific modes, male or female. While 78 per cent of the respondents believed it should be women, a section of respondents also believed that women cannot prove to be successful drivers and, therefore, responded otherwise (Figure 32).

Figure 32: Preference for women drivers of women-only public transport. Source: Primary survey
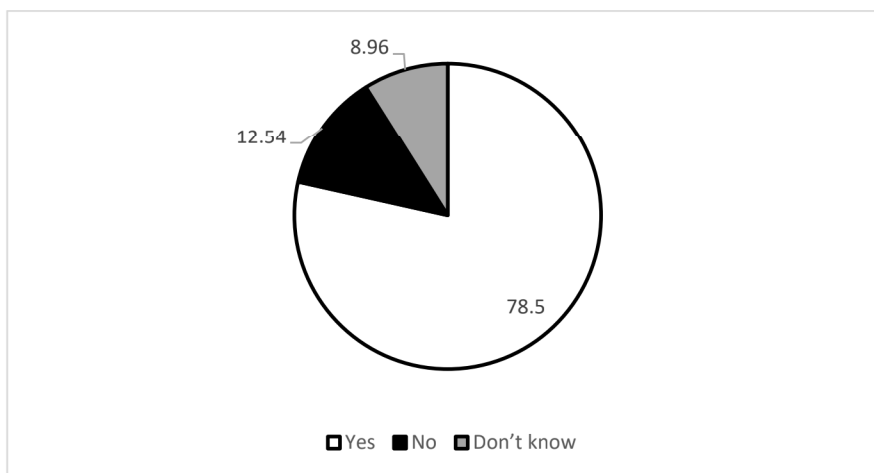
One possible glitch which women travelers face while accessing public transport is safety. A possible solution for this could be women driving gender-neutral public modes. We, therefore,

recorded the outlook of different individuals on the same. While 78 per cent are in favor of the idea and would willingly travel on these modes, 17 per cent doubt the credibility of women drivers (Figure 33).

Figure 33: Preference for women drivers of gender-neutral public transport. Source: Primary survey
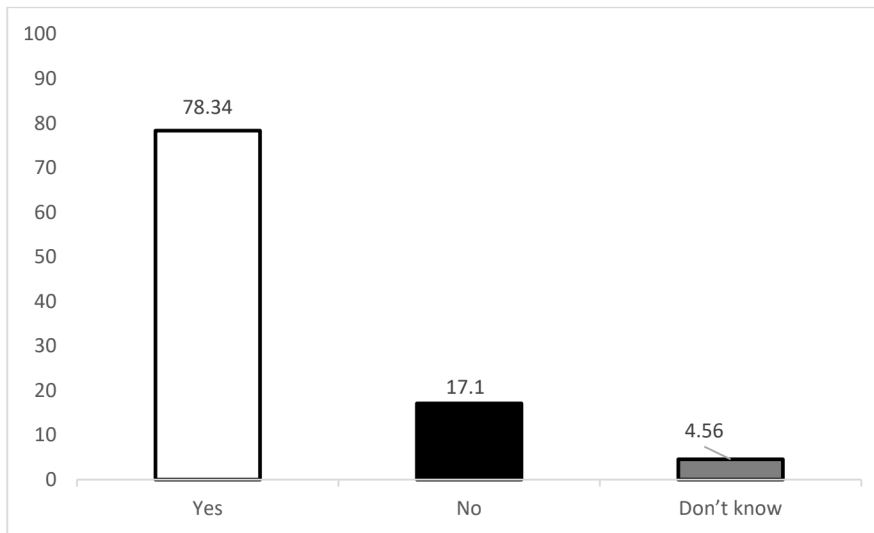
Mobility crucially regulates empowerment. Accessibility to public transport determines mobility. Our study highlights how women are facing issues of immobility by travelling less frequently and to shorter distances. For this purpose, public transport should be made more accessible by expanding its affordability. One way of doing is providing free tickets to women travelers. We inspected the same and concluded that while 66 per cent of the respondents are in favor of such a move, 33 per cent believe such privilege should not be provided based on one's gender (Figure 34).

Figure 34: Preference for free tickets for women on public transport. Source: Primary survey
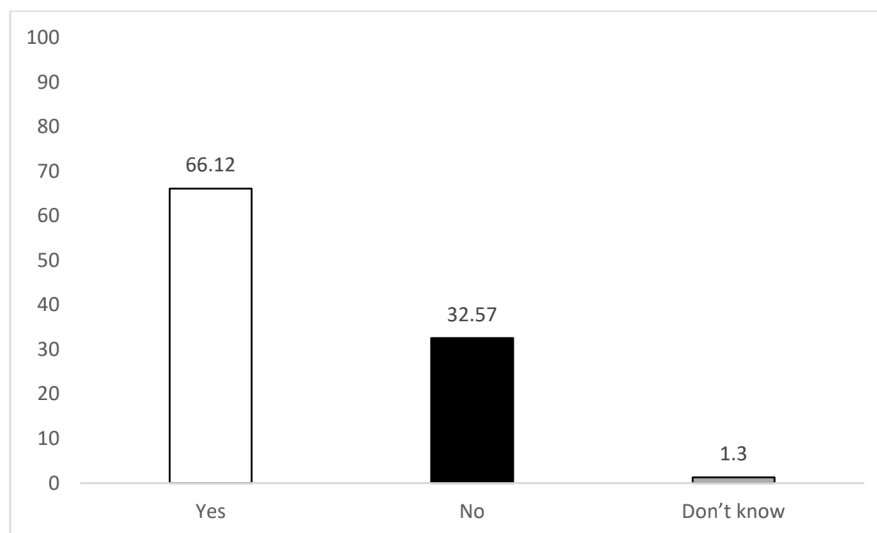
4.2.3.2 Part-II

Results and Discussion

Table 44 is a table of descriptive statistics of the data employed in the study. It briefly introduces each variable with the corresponding frequency/ percentage of respondents in each category.

Table 44: Brief summary of sample characteristics. Source: Primary survey

Characteristics		Percentage of respondents
Use of public transport	Yes	24.59
	No	75.41
Rationale for not preferring public transport over private	Unsafe	13.84
	Others	86.16
Gender	Female	47.56
	Male	52.44
Age	18-25 years	35.50
	26-39 years	38.93
	40-59 years	25.57
Marital status	Married	62.05
	Others	37.95
Education	Below standard	12.54

	Between standard 5 and 12	33.55
	Above standard 12	53.91
Work status	Working	60.91
	Non-working	39.09
Monthly per capita consumption expenditure (in INR[a]):	≤ 2500	31.54
	2501-7000	44.30
	>7000	24.16
Missing data of monthly per capita consumption expenditure		5.54
House ownership (Only of respondents with missing data):	Owned	47.06
	Rented	35.29
	Occupied rent-free	17.65
House type (Only of respondents with missing data):	Pucca	79.41
	Semi-pucca	20.59
	Kutccha	0.00

[a]INR is Indian Rupee, US$1~INR 71.285 as on February 2020.

Before fitting the probit model, we first check if there exists any relationship between the outcome variables and the explanatory variables. For this purpose, a chi-square test was performed, the results of which are presented in table 45. While gender, marital status and age are established to be associated with use of public transport, gender, education and work status are associated with the argument for not preferring public transport over private.

Table 45: Chi- square test of association between outcome and each independent variable. Source: Primary survey

Explanatory variable	Use of public transport		Rationale for not preferring public transport over private	
	Chi-square	p value	Chi-square	p value
Gender	5.2317	0.022**	77.3082	0.000***
Age	24.3187	0.000***	3.8261	0.148
Marital status	19.2162	0.000***	0.6147	0.433
Education	1.2759	0.528	5.3283	0.070*
Work status	0.0000	0.997	4.4164	0.036**
SEG	1.5737	0.455	3.0259	0.220

Note: *** $p<0.01$, ** $p<0.05$, * $p<0.1$

To analyze the impact that each explanatory variable has on choice of public transport and the rationale for not preferring it, we use a univariate regression analysis. Table 46 shows the results of univariate probit model for use of public transport. From the chi square test of association, only gender, age and marital status were found to be significantly associated with this outcome variable. However, the results of the univariate probit model indicate that education and work status also significantly affect the choice to make use of public transport in the city. Table 47 presents the results of univariate probit model for insecurity as the reason for preferring private transport over public transport. Gender and education, which were also significant in the chi square test of association, were found to have a significant impact of this response variable. The results show that gender, marital status and age were significantly affecting the use of public transport and gender and education were significantly influencing the reason for not using it, whether fitted alone or along with other variables.

Table 46: Univariate probit model for use of public transport. Source: Primary survey

Explanatory variable	Coefficient	Standard error	Z statistic	p value	Marginal effects
Gender (ref: male)	0.385	0.127	3.03	0.002***	0.153
Age: 18-25 years (ref: 40-59 years)	0.309	0.187	1.65	0.099*	0.123
Age: 26-39 years (ref: 40-59 years)	-0.294	0.154	-1.91	0.056*	-0.117
Marital status (ref: unmarried)	-0.371	0.159	-2.33	0.020**	-0.148
Education: < class 5th (ref: > class12^{th})	0.278	0.198	1.40	0.161	0.111
Education: class 5th- 12th (ref: > class12^{th})	0.246	0.144	1.71	0.087*	0.098
Work status (ref: non-working)	0.349	0.136	2.57	0.010***	0.139
Socioeconomic group: SEG1 (ref: SEG3)	0.123	0.175	0.70	0.481	0.049
Socioeconomic group: SEG2 (ref: SEG3)	-0.072	0.150	-0.48	0.632	-0.029
Constant	-1.021	0.233	-4.38	0.000***	
Pseudo R-squared	0.071				
LR chi-square	48.59				

Hosmer-Lemeshow Prob > Chi-Square	0.169
Per cent correctly predicted	64.33%
Area under ROC curve	0.70

Note: *** *p<0.01, ** p<0.05, * p<0.1*

Table 47: Univariate probit model for rationale for not preferring public transport over private. Source: Primary survey

Explanatory variable	Coefficient	Standard error	Z statistic	*p* value	Marginal effects
Use of public transport (ref: do not use)	0.168	.171938	0.98	0.328	0.019
Gender (ref: male)	1.617	0.204	7.94	0.000***	0.180
Age: 18-25 years (ref: 40-59 years)	-0.401	0.257	-1.56	0.118	-0.045
Age: 26-39 years (ref: 40-59 years)	-0.027	0.186	-0.14	0.887	-0.003
Marital status (ref: unmarried)	0.099	0.216	0.46	0.648	0.011
Education: < class 5th (ref: > class12th)	-1.078	0.281	-3.84	0.000***	-0.120
Education: class 5th- 12th (ref: > class12th)	-0.376	0.188	-2.00	0.046**	-0.042
Work status (ref: non-working)	0.214	0.166	1.29	0.198	0.024
Socioeconomic group: SEG1 (ref: SEG3)	0.167	0.236	0.71	0.478	0.019
Socioeconomic group: SEG2 (ref: SEG3)	0.149	0.184	0.81	0.416	0.017
Constant	-2.131	0.338	-6.30	0.000***	
Pseudo R-squared	0.223				
LR chi-square	110.26				
Hosmer-Lemeshow Prob > Chi-Square	0.346				
Per cent correctly predicted	73.13%				
Area under ROC curve	0.826				

Note: *** *p<0.01, ** p<0.05, * p<0.1*

We first fit the data using a bivariate probit model and then using a seemingly unrelated bivariate probit model to jointly analyze the impact that different explanatory variables in the study have on the two response variables. We can then select the model that best fits the data.

Table 48 represents a bivariate probit model for use of public transport and rationale for not using it. The results of this analysis reveal that while gender, age, marital status, education and work status have a significant impact on choice of public transport in the city, only gender and education have an impact on the logic behind not using it. The results of average marginal effects calculated for the two response variables show that women have 6 per cent higher chance of using public transport than men. While individuals in the youngest age group have approximately 14 per cent higher chance of using public transport than the eldest age group of individuals, those in the middle age group have 11 per cent lower chance of using the same. Married individuals have 14.5 per cent lower chance of using public transport than unmarried individuals. The least educated and the moderately educated have 16.3 per cent and 11.4 per cent higher chance of using public transport, respectively. Working individuals have 12 per cent higher chance of using public transport than non-working individuals. The average marginal effects of the rationale for not preferring public transport over private exhibit that women have 6.5 per cent higher chance of finding public transport unsafe and thereby deferring its use than men. Those with the least and moderate levels of education have 5.2 per cent and 2 per cent lower chance of not preferring public transport over private because they find it unsafe, than those who have the highest levels of education.

The overall fit of the model is tested using the Wald test, where Wald chi2(18) = 122.95 and p-value is 0.0000, depicting that the model is significant. The model is also tested for the presence of correlation, where the likelihood ratio test, however, does not reject the null hypothesis of zero correlation between the two outcome variables with chi2(1) = 1.1431 and p-value = 0.2850. This implies that the correlation between use of public transport and the reason for not preferring it over private transport is insignificant. We, however, continue with fitting the seemingly unrelated bivariate probit model.

Table 48: Bivariate probit model for use of public transport and rationale for not preferring public transport over private. Source: Primary survey

Outcome variable	Explanatory variable	Coefficient	Standard error	Z statistic	p value	Marginal effects
Use of public transport (1= use, 0= do not use)	Gender (ref: male)	0.385	0.127	3.03	0.002***	0.060
	Age: 18-25 years (ref: 40-59 years)	0.311	0.187	1.66	0.097*	0.138
	Age: 26-39 years (ref: 40-59 years)	-0.296	0.154	-1.92	0.055*	-0.110
	Marital status (ref: unmarried)	-0.371	0.159	-2.32	0.020**	-0.145
	Education: < class 5th (ref: > class12th)	0.281	0.199	1.42	0.156	0.163
	Education: class 5th- 12th (ref: > class12th)	0.249	0.144	1.73	0.083*	0.114
	Work status (ref: non-working)	0.348	0.135	2.57	0.010*	0.120
	Socioeconomic group: SEG1 (ref: SEG3)	0.118	0.176	0.68	0.500	0.036
	Socioeconomic group: SEG2 (ref: SEG3)	-0.074	0.150	-0.50	0.620	-0.036
	Constant	-1.021	0.233	-4.38	0.000***	
Rationale for not preferring public transport over private (1= unsafe, 0= others)	Gender (ref: male)	1.633	0.203	8.05	0.000***	0.065
	Age: 18-25 years (ref: 40-59 years)	-0.380	0.257	-1.48	0.138	-0.022
	Age: 26-39 years (ref: 40-59 years)	-0.040	0.185	-0.22	0.829	0.004
	Marital status (ref: unmarried)	0.081	0.213	0.38	0.705	0.010
	Education: < class 5th (ref: > class12th)	-1.061	0.280	-3.79	0.000***	-0.052
	Education: Class 5th- 12th (ref: > class12th)	-0.362	0.187	-1.93	0.053*	-0.020

	Work status (ref: non-working)	0.231	0.165	1.40	0.161	0.004
	Socioeconomic group: SEG1 (ref: SEG3)	0.171	0.235	0.73	0.467	0.005
	Socioeconomic group: SEG2 (ref: SEG3)	0.145	0.183	0.79	0.429	0.008
	Constant	-2.100174	.3337329	-6.29	0.000***	
Rho		0.109	0.101			

The results of the seemingly unrelated bivariate probit model are represented in table 49. In this model, we include only those variables which give the most significant results when analyzed together. The results show that gender, age, marital status, education and work status have a significant impact on choice of using of public transport, and use of public transport, work status, education and gender have a significant impact on emphasizing safety as the reason for not preferring public transport over private. The results of average marginal effects specify that women have 14.5 per cent higher chance of using public transport than men. While the youngest group of individuals have 15.1 per cent higher chance of choosing to use public transport, the group of middle-aged individuals have 9.1 per cent lower chance of using the same as compared to the eldest group of individuals. Married people have 13.4 per cent lower chance of using public transport than unmarried people. The least educated group of individuals and the medially educated group of individuals have 13.6 per cent and 12 per cent higher chance of using public transport than the most educated group of individuals. Working people have 13.7 per cent higher chance of using public transport than non-working people.

Table 49: Seemingly unrelated bivariate probit model for use of public transport and rationale for not preferring public transport over private. Source: Primary survey

Outcome variable	Explanatory variable	Coefficient	Standard error	Z statistic	p value	Marginal effects
Use of public transport (1= use, 0= do not use)	Gender (ref: male)	0.368	0.126	2.92	0.003***	0.145
	Age: 18-25 years (ref: 40-59 years)	0.384	0.172	2.23	0.026**	0.151
	Age: 26-39 years (ref: 40-59 years)	-0.234	0.148	-1.58	0.115	-0.091
	Marital status (ref: unmarried)	-0.346	0.150	-2.30	0.022**	-0.134
	Education: < class 5th (ref: > class12th)	0.344	0.187	1.84	0.066*	0.136
	Education: class 5th- 12th (ref: > class12th)	0.304	0.134	2.26	0.02**	0.120
	Work status (ref: non-working)	0.348	0.134	2.60	0.009***	0.137
	Constant	-1.109	0.216	-5.14	0.000***	
Rationale for not preferring public transport over private (1= unsafe, 0= others)	Use of public transport (ref: do not use public transport)	-0.982	0.286	-3.43	0.001***	-0.185
	Gender (ref: male)	1.481	0.209	7.09	0.000***	0.041
	Education: < class 5th (ref: > class12th)	-0.671	0.241	-2.78	0.005***	-0.103
	Education: Class 5th- 12th (ref: > class12th)	-0.151	0.145	-1.04	0.297	-0.015
	Work status (ref: non-working)	0.322	0.144	2.24	0.025**	0.022
	Constant	-1.732	0.294	-5.89	0.000***	
Rho		0.700	0.179			

Note: *** p<0.01, ** p<0.05, * p<0.1

The results for the average marginal effects of rationale for not preferring public transport over private suggest that those who use public transport have 18.5 per cent lower chance of mentioning safety as the reason for not preferring it over private transport as compared to those who do not use the mode. Women have 4.1 per cent higher chance of finding public transport unsafe and thereby not preferring it over private transport than men. The most educated group of individuals and the moderately educated group of individuals have 10.3 per cent and 1.5 per cent lower chance of finding public transport unsafe and thereby not preferring it over private modes than the most educated group. Working individuals have 2.2 per cent higher chance of not preferring public transport over private because they find it unsafe.

The overall fit of the model is tested using the Wald test which gives Wald chi2(12) = 165.96 and p-value=0.0000, implying that the model is significant. The likelihood ratio test rejects the null hypothesis of zero correlation between usage of public transport and the reason for not preferring it over private transport (chi2(1) = 6.61346 and p-value = 0.0101).

4.3 Conclusion

In this chapter of the thesis, we discussed the data interpretation and analysis of the methods employed to achieve our proposed objectives. The investigation begun with analysis of gender-based differences in different measures of travel behavior in urban and rural settings of India using available secondary data and surveyed primary data. We then explored the gender differences in travel pattern on the basis of socioeconomic status of individuals in the surveyed study area. Lastly, we presented an analysis that proposes policy measures which could be taken to sensitize the transportation system in favor of women.