

Appendix A

A. Further details of multilevel modelling

The following presents the formulas of the Multilevel linear regression model (Raudenbush & Bryk, 2002).

Level 1 (the individual level):

$$y_{ij} = \beta_{0j} + \beta_{1j}x_{ij} + \varepsilon_{ij}; \quad (A1)$$

where y_{ij} refers to the dependent variable (duration of commuting/non-commuting walking) for individual i living in community j ; x_{ij} refers to the vector of the Level 1 independent variables (i.e., socio-demographic variables); β_{0j} represents the intercept of the dependent variable in community j (Level 2); β_{1j} represents the slope for the relationship between the Level 1 independent variables and the dependent variable in community j ; and ε_{ij} represents the random error of the Level 1.

Level 2 (the community level):

$$\beta_{0j} = \gamma_{00} + \gamma_{01}\omega_j + \mu_{0j}; \quad (A2)$$

$$\beta_{1j} = \gamma_{10} + \mu_{1j}. \quad (A3)$$

where γ_{00} indicates the overall intercept; ω_j indicates the vector of Level 2 independent variables, i.e., the built environment variables; γ_{01} indicates the overall regression coefficient, between the Level 2 variables and dependent variable; μ_{0j} indicates the random error; and μ_{1j} indicates the error component for the slope.

B. Results of Pearson's Correlation Test

Table A1. Pearson's correlation analysis of built environment variables

	X1	X2	X3	X4	X5	X6	X7
Population Density (X1)	1.00						
Job density (X2)	0.54	1.00					
Land-use mix (X3)	0.28	0.18	1.00				
Intersection Density (X4)	0.58	0.28	0.11	1.00			
Bus Stop Density (X5)	0.52	0.51	0.26	0.20	1.00		
Distance to city center (X6)	-0.57	-0.46	-0.37	-0.26	-0.45	1.00	
Daily public facility density (X7)	0.54	0.61	0.16	0.44	0.49	-0.46	1.00

C. Results of the sensitivity test

Table A2. Results of multilevel zero-inflated negative binomial regression and multilevel Tobit regression based on the subsets (30%)

Variables	Frequency		Duration	
	Commuting Coef. [z]	Non-commuting Coef. [z]	Commuting Coef. [z]	Non-commuting Coef. [z]
Level 1 variables				
Age	-0.01[-1.03]	0.01***[11.71]	-0.02[-0.23]	0.83***[16.96]
Gender				
Male	Ref.	Ref.	Ref.	Ref.
Female	0.36***[10.37]	0.33***[13.71]	16.21***[11.14]	20.71***[16.26]
Hukou				
Non-Xiamen hukou	Ref.	Ref.	Ref.	Ref.
Xiamen hukou	-0.06[-0.96]	-0.06*[-1.71]	-5.14**[-2.07]	-7.19***[-3.6]
Education				
Middle School and below	Ref.	Ref.	Ref.	Ref.
High School to Junior College	-0.52***[-10.24]	-0.08**[-2.91]	-22.03***[-12.15]	-6.6***[-4.62]
Undergraduate and above	-0.93***[-12.17]	-0.16**[-3.26]	-32.11***[-12.04]	-6.81**[-2.75]
Occupation				
Blue-collars	Ref.	Ref.	Ref.	Ref.
Students	0.97***[13.01]	-0.2*[-2.15]	39.27***[13.07]	10.44**[2.42]
White-collars	0.07[1.23]	-0.33***[-6.79]	1.88[0.96]	-9.63***[-4.17]
Officials	0.32**[2.25]	-0.19*[-1.83]	10.49**[2.22]	-7.65[-1.62]
Family size				
Small family (1 to 2)	Ref.	Ref.	Ref.	Ref.
Middle-size family (3 to 7)	-0.13**[-3.18]	0.11***[4.7]	-6.53***[-3.71]	3.24**[2.35]
Large family (8 to 10)	-0.14[-1.07]	0.12*[1.83]	-6.61[-1.37]	2.69[0.74]
Residence size (m²)	0.01[0.19]	-0.01**[-3.23]	-0.01[-0.7]	-0.04**[-3.07]
Residence type				
Self-owned	Ref.	Ref.	Ref.	Ref.
Danwei-assigned residence	0.08[0.52]	-0.09[-0.94]	1.71[0.25]	1.98[0.34]
Self-rental residence	0.07[1.09]	-0.07*[-1.89]	2.92[1.14]	-3.51*[-1.72]
Motor vehicle ownership				
No vehicle	Ref.	Ref.	Ref.	Ref.
At least one vehicle	-0.33***[-7.94]	-0.14***[-5.43]	-15.38***[-8.82]	-11.46***[-7.95]
Level 2 variables				

Population density				
0-100 per ha	Ref.	Ref.	Ref.	Ref.
100-300 per ha	0.11[1.14]	0.19**[2.56]	3.23[0.88]	10.42**[2.87]
300-600 per ha	0.12[1.49]	0.26**[2.35]	5.25[1.30]	10.68**[2.65]
600-900 per ha	0.07[0.51]	0.01[0.11]	2.24[0.46]	-1.38[-0.28]
Job density	0.01[-0.48]	0.01[-0.41]	-0.11[-0.43]	-0.11[-0.44]
Land-use mix (Entropy)	1.01***[5.01]	0.45***[3.31]	34.2***[4.66]	17.4**[2.61]
Intersection density	0.05[0.45]	0.06[0.7]	7.84[1.51]	4.94[0.96]
Distance to city center	-0.01**[-2.71]	-0.01**[-2.93]	-0.53***[-3.14]	-0.56***[-3.49]
Bus stop density	-0.03[-0.67]	0.02[0.52]	-2.39[-1.16]	3.52[0.81]
Daily public facility density	0.02[0.92]	0.02**[2.01]	0.7[1.37]	0.8*[1.93]
Sample size	15,250	10,522	15,250	10,522
ICC	0.150	0.175	0.155	0.180
Over-dispersion parameter (κ)	2.015	1.001	N/A	
Zero-inflation (π)	0.453	0.340	N/A	
Log-likelihood	-12692.5	-13911.4	-22586.25	-30112.69
AIC	25443.0	27880.8	45228.5	60281.4

Note: Coef. = Coefficient; [z] = z value; [t] = t value; Ref. = Reference; * p<0.1; ** p<0.05; *** p<0.001.

D. Significance test of the differences in coefficients between models by different purposes

We combined the samples of walking for commuting and non-commuting, created a dummy variable indicating whether the trip is for commuting or non-commuting (i.e., “commuting or non-commuting,” CoN), incorporated interaction terms between the dummy variable and all the independent variables, and rebuild the models for frequency and duration. The results are presented in Table A3. For simplicity, we only report the coefficients of the dummy variable and interaction terms here.

Table A3. Results of combined models incorporating dummy variable and interaction terms

Variables	Frequency	Duration
	Coef. [z]	Coef. [z]
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Commuting or non-commuting (CoN)	-0.15***[-10.28]	-27.88***[4.94]
<i>Level 1 variables</i>		
Age * CoN	-0.01***[-10.16]	-0.86***[-17.57]
Gender * CoN		
Male	Ref.	Ref.
Female	0.01[0.17]	-4.50***[-4.35]
Hukou * CoN		
Non-Xiamen hukou	Ref.	Ref.
Xiamen hukou	0.08**[2.22]	5.20***[3.14]
Education * CoN		

Middle School and below	Ref.	Ref.
High School to Junior College	-0.52***[-17.54]	21.73***[11.16]
Undergraduate and above	-0.82***[-16.62]	7.5***[4.07]
Occupation * CoN		
Blue-collars	Ref.	Ref.
Students	0.98***[14.89]	-8.24***[-2.26]
White-collars	0.22***[5.24]	12.95***[2.91]
Officials	0.18*[1.87]	-1.79[-0.47]
Family size * CoN		
Small family (1 to 2)	Ref.	Ref.
Middle-size family (3 to 7)	-0.25***[-9.08]	13.02***[4.06]
Large family (8 to 10)	-0.41***[-5.32]	4.53[1.47]
Residence size * CoN	0.01[0.09]	0.01[1.39]
Residence type * CoN		
Self-owned	Ref.	Ref.
Danwei-assigned residence	0.24**[2.36]	-8.32***[-4.94]
Self-rental residence	0.17***[4.59]	1.24[0.25]
Motor vehicle ownership * CoN		
No vehicle	Ref.	Ref.
At least one vehicle	-0.18***[-6.85]	-3.78***[-3.18]
Level 2 variables		
Population density * CoN		
0-100 per ha	Ref.	Ref.
100-300 per ha	-0.06[-1.57]	-1.53[-0.81]
300-600 per ha	0.08**[2.12]	-6.06***[-3.12]
600-900 per ha	0.09**[2.22]	-1.30[-0.84]
Job density * CoN	0.01**[1.99]	0.26**[2.27]
Land-use mix (Entropy) * CoN	0.28**[2.66]	6.68[1.62]
Intersection density * CoN	-0.03[-0.64]	-1.30[-0.5]
Distance to city center * CoN	0.01[1.08]	-3.38***[-3.7]
Bus stop density * CoN	-0.03[-1.26]	0.16**[2.14]
Daily public facility density * CoN	-0.01**[-3.08]	-0.55***[-3.37]
Sample size	85,521	85,521
ICC	0.185	0.194
Over-dispersion parameter (κ)	1.7226	N/A
Zero-inflation (π)	0.27328	N/A
Log-likelihood	-89182.9	-174743.6
AIC	178467.8	349587.2

Note: Coef. = Coefficient; [z] = z value; Ref. = Reference; * p<0.1; ** p<0.05; *** p<0.001.

References

Raudenbush, S. W., & Bryk, A. S. (2002). *Hierarchical linear models: Applications and data analysis methods* (Vol. 1). Sage.