Velilla, Jorge; Ortega, Raquel; Gutiérrez-Lythgoe, Antonio

Article

The urban mobility of elder workers : evidence with the American Time Use Survey (2003-2018)

Reference: Velilla, Jorge/Ortega, Raquel et. al. (2023). The urban mobility of elder workers : evidence with the American Time Use Survey (2003-2018). In: Economics and Business Letters 12 (4), S. 306 - 312.
https://reunido.uniovi.es/index.php/EBL/article/download/19438/16129/63909.
doi:10.17811/ebl.12.4.2023.306-312.

Economics and Business Letters
12(4), 306-312, 2023

The urban mobility of elder workers: evidence with the American time use survey (2003-2018)

Jorge Velilla [1,*] • Raquel Ortega-Lapiedra [1] • Antonio Gutiérrez-Lythgoe [1]

[1]*Department of Economic Analysis and IEDIS, University of Zaragoza, Spain*

Received: 17 February 2023
Revised: 13 July 2023
Accepted: 29 August 2023

Abstract

This paper explores the commuting behavior of elder workers in the United States. Using detailed time diaries from the American Time Use Survey for the years 2003-2018, estimates reveal a positive correlation between the time spent commuting and residing in metropolitan areas, which is also driven by longer commutes in more populated metropolitan areas. Furthermore, elder workers in metropolitan areas of more than 2.5 million inhabitants use more public transports in their commuting trips than similar workers in less-populated or non-metropolitan areas. The analysis presented here may allow policy makers to identify which elder workers may be more affected by the negative consequences of commuting, and which groups of elder workers have more limitations in their commuting behaviors.

Keywords: Commuting time; Elder workers; Metropolitan areas; Population size; American time use survey.
JEL Classification Codes: R40, J14

1. Introduction

Commuting ranks among the most important trips in workers' daily activity. However, long commutes relate to several negative outcomes, such as decreased health (Kunn-Nelen, 2016), lower wellbeing (Kahneman and Krueger, 2006) and stress (Gottholmseder et al., 2009), among others. Given its importance, commuting plays a central role in daily mobility planning. On the other hand, demographic ageing has become a generalized phenomenon in developed countries, and one important aspect of ageing is the ability to satisfy the mobility necessities, which includes commuting when workers are close to retirement.

Apart from the aforementioned negative consequences of commuting, ageing often implies some loss of functional abilities and constraints for mobility (Beige and Axhausen, 2017). Thus, the analysis of commuting patterns of elder workers is relevant to identify which elder workers may be affected by the negative consequences of commuting, and which workers have more limitations in their commuting behavior. On the other hand, urban/rural status, metropolitan

[*] Corresponding author. E-mail: jvelilla@unizar.es

Citation: Velilla, J., Ortega-Lapiedra, R. and Gutiérrez-Lythgoe, A. (2023) The urban mobility of elder workers: evidence with the American time use survey (2003-2018), *Economics and Business Letters,* 12(4), 306-312.

DOI: 10.17811/ebl.12.4.2023.306-312

size, and geographical characteristics of the areas of residence have been found to shape commuting patterns of workers, though these relationships have been found to be complex (Hu and Schneider, 2017).

We focus on the relationships between commuting time, transport mode, and metropolitan characteristics for US workers aged 55 years or more, using the American Time Use Survey (ATUS) from years 2003-2018. We contribute to the study of commuting behaviors of elder workers, by analyzing the relevance of metropolitan status and the metropolitan population size, on the one hand, and the daily minutes spent commuting and the mode of transport chosen for daily commutes, on the other.

2. Data

We use data from the ATUS, for the years 2003 to 2018. The ATUS is sponsored by the BLS and is included as part of the IPUMS (Hofferth et al., 2020), and includes demographics of respondents, but also time use diaries where respondents report their activities during the 24 hours of the day, which provide reliable information (Bonke, 2005). We select employed workers who are 55 years old or elder, in line with Velilla et al. (2018).[1] Furthermore, we restrict the sample to working days (days in which workers spend more than 60 minutes working). These restrictions leave a sample of 5,697 males, and 5,415 females.

The main dependent variable is the commuting time of workers, defined from activity code 180501 ("commuting to/from work"), and measured in minutes per day. The ATUS data also defines whether individuals reside in metropolitan areas or non-metropolitan areas (1990 Census of Population and Housing classification), and the population size of the MSA where respondents reside: 0) not identified or non-metropolitan; 2) 100,000-249,999; 3) 250,000-499,999; 4) 500,000-999,999; 5) 1,000,000-2,499,999; 6) 2,500,000-4,999,999; 7) 5,000,000+. We also define demographics related to commuting behaviors, namely ages, education, race, US citizenship, marital status, number of children, family size, public worker and self-employment status, full-time status, dwelling status, and occupation. Furthermore, the ATUS data allows us to compute the mode of transport of commuting episodes: private vehicle ("car, truck, or motorcycle"), active ("walking" and "bicycle"), public transport ("bus", "subway/train", "boat/ferry" and "taxi/limousine"), and other. Summary statistics are shown in Table 1.

Table 1. Commuting time and mode of transport by metropolitan status

	Females				**Males**			
	Non-metropolitan		**Metropolitan**		**Non-metropolitan**		**Metropolitan**	
	Mean	**S.D.**	**Mean**	**S.D.**	**Mean**	**S.D.**	**Mean**	**S.D.**
Commuting time	24.696	29.975	36.264	37.262	35.997	49.626	42.454	44.017
By private vehicle	0.935	0.223	0.911	0.259	0.94	0.207	0.921	0.242
Active commuting	0.037	0.179	0.03	0.146	0.028	0.154	0.031	0.149
By public transport	0.006	0.067	0.032	0.151	0.005	0.062	0.024	0.133
By other transport mode	0.022	0.119	0.027	0.126	0.027	0.129	0.024	0.123
Observations	996		4419		1024		4673	

Note: The sample (ATUS 2003-2018) is restricted to employed workers aged 55 or more and working days. Averages computed using sample weights.

3. Results

[1] The United Nations defines "seniority" as someone over 60 years old, while for the US Census the threshold is set at 65 years. However, most individuals do not work at seniority, as full retirement age in the US starts at 66 or 67. We instead consider 55 years, as this age is often related to some privileges (e.g., senior discounts), and has been found to be a threshold for travel behaviors (Semple et al., 2023), while other thresholds (60 or 65 years old) seem more appropriate for non-work trips (Gimenez-Nadal et al., 2022).

We explore different commuting behaviors among elder workers according to their metropolitan status and the MSA size, and we estimate a linear regression on the log-of-commuting time form females and males, in terms of the dummy that identifies workers in metropolitan areas, dummies that identify MSA sizes, demographics, and year, state, day of week and occupation fixed effects. Estimates include robust standard errors and sample weights, and regressors do not suffer from multicollinearity according to VIFs. We also explore differences in transport modes, and we run similar regressions but using the rates of commuting by transport mode as dependent variables. Because MSA size is not identified for workers in non-metropolitan areas, we run separate regressions for metropolitan status and MSA sizes.

Table 2 shows the main estimates on commuting time. Among elder female workers, those in metropolitan areas commute 26.9% more than counterparts in non-metropolitan areas. Among elder males, those in metropolitan areas commute 20.5% more than counterparts in non-metropolitan areas. These coefficients are not different between women and men, according to a *t*-test ($p = 0.495$).

Table 2. Main estimates on commuting time

	(1)	(2)	(3)	(4)
	Women		Men	
Variables	**Metrop.**	**MSA size**	**Metrop.**	**MSA size**
Metropolitan area	0.269***		0.205***	
	(0.064)		(0.068)	
MSA sizes:				
100,000-249,999		0.068		0.147
		(0.094)		(0.101)
250,000-499,999		0.243***		0.027
		(0.089)		(0.095)
500,000-999,999		0.233***		0.190**
		(0.087)		(0.095)
1,000,000-2,499,999		0.290***		0.332***
		(0.080)		(0.082)
2,500,000-4,999,999		0.261***		0.284***
		(0.092)		(0.094)
5,000,000+		0.421***		0.356***
		(0.095)		(0.098)
All controls and constant	Yes	Yes	Yes	Yes
Observations	5,415	5,415	5,697	5,697
R-squared	0.136	0.138	0.129	0.133

Note: Robust standard errors in parentheses. The sample (ATUS 2003-2018) is restricted to employed workers aged 55 or more and working days. Estimates computed using sample weights. The dependent variable is the log-of-commuting time. *** Significant at the 1%; ** significant at the 5%; * significant at the 10%.

If we analyze differences arising from different MSA size, for elder females, non-metropolitan areas and MSAs with a low population do not differ in the commuting time of their inhabitants. However, estimates for the remaining dummies are positive and significant, and differences rank between +24.3% among workers in areas with 250,000-499,999 inhabitants, and +42.1% among workers in MSAs with more than 5 million inhabitants, relative to non-metropolitan areas. Among elder males, results are similar, but the correlation seems smaller than among females. Elder males in MSAs of 500,000-999,999 inhabitants commute about +20% than workers in non-metropolitan areas, with differences increasing to +35.6% for workers in MSAs of more than 5 million inhabitants.

Table 3 shows the main estimates for commuting mode and metropolitan variables.[2] The main coefficients are not significant, and only the rate of commuting by public transport among male elder workers is significant, but only at 10%. Regarding MSA sizes and commuting mode, among elder females there is a lower use of private vehicles in metropolitan areas of 2,500,000 or more inhabitants, compensated with a more intense use of public transport. Regarding the modes of transport of elder male workers, estimates suggest a more complex relationships, but also point to a more intense use of public transport in more populated areas.

We have conducted some robustness checks. For instance, results using Tobit estimates, appropriate when variables are censored (e.g., times are left-censored, and rates are left- and right-censored), are shown in Appendix Tables A1 and A2, and the conclusions are robust to results in Tables 2 and 3, respectively, in line with existing research on time use comparing OLS estimates and Tobit models (Frazis and Stewart, 2012; Gershuny, 2012; Foster and Kalenkoski, 2013). Other robustness checks include estimates restricted to commuters, estimates controlling for the main mode of transport, and estimates restricted to workers who commute by private vehicle. All these results are robust to the main estimates and are available upon request.

Table 3. Transport modes

	(1)	(2)	(3)	(4)	(5)	(6)
		Women			Men	
Variables	Rate private	Rate active	Rate public	Rate private	Rate active	Rate public
Metropolitan area	0.001	-0.008	0.006	0.005	-0.008	0.007*
	(0.011)	(0.009)	(0.004)	(0.011)	(0.008)	(0.004)
All controls and constant	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,401	4,401	4,401	4,514	4,514	4,514
R-squared	0.098	0.056	0.120	0.079	0.051	0.075
MSA sizes:						
100,000-249,999	0.015	-0.005	-0.002	0.023	-0.010	-0.000
	(0.016)	(0.013)	(0.004)	(0.015)	(0.012)	(0.005)
250,000-499,999	0.004	-0.009	0.006	-0.001	0.011	-0.004
	(0.014)	(0.009)	(0.006)	(0.018)	(0.014)	(0.006)
500,000-999,999	0.024*	-0.010	-0.007	0.026**	-0.015*	-0.003
	(0.014)	(0.011)	(0.006)	(0.012)	(0.008)	(0.005)
1,000,000-2,499,999	0.012	-0.011	-0.000	-0.004	0.005	0.003
	(0.014)	(0.010)	(0.006)	(0.013)	(0.010)	(0.006)
2,500,000-4,999,999	-0.035**	0.001	0.028***	-0.022	-0.012	0.021**
	(0.016)	(0.011)	(0.008)	(0.017)	(0.009)	(0.009)
5,000,000+	-0.086***	0.018	0.055***	-0.009	-0.010	0.035***
	(0.019)	(0.013)	(0.009)	(0.017)	(0.010)	(0.010)
All controls and constant	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,401	4,401	4,401	4,514	4,514	4,514
R-squared	0.112	0.058	0.135	0.082	0.053	0.083

Note: Robust standard errors in parentheses. The sample (ATUS 2003-2018) is restricted to employed workers aged 55 or more and working days. Workers who report zero commuting are excluded. Estimates computed using sample weights. *** Significant at the 1%; ** significant at the 5%; * significant at the 10%.

[2] Some variables and categories are not statistically significant, which could induce potential bias. However, MSA size is defined as a factor variable, and thus we cannot simply omit the not significant categories. Furthermore, although some demographic controls may be not significant, they are included because they may relate to the dependent variable (e.g., commuting time and commuting modes) overlapping with the main independent variables. (See Gimenez-Nadal et al. (2021) for a literature review on commuting behaviors worker demographic characteristics.) We thus need to control for them to avoid omitted variable bias, regardless of their statistical significance.

4. Concluding remarks

This paper addresses the relationships between commuting behavior and metropolitan characteristics of elder workers in the US, using the ATUS 2003-2018 data. Results suggest that elder workers in metropolitan areas commute longer times than counterparts in non-metropolitan areas, and tend to commute more by public transport, and less by private vehicle. The analysis has certain limitations: data is cross-sectional and we cannot find causal results, and commuting depends on unobservables (Van Ommeren and Van der Straaten, 2008). Furthermore, despite we use log-linear regression as is standard in time use studies (Aguiar and Hurst, 2007; Gershuny, 2012; Foster and Kalenkoski. 2013), including the analysis of commuting time (van Ommeren and van der Straaten, 2008; Gimenez-Nadal et al., 2021), the dependent variable is durational. Then, survival models or hazard-based duration models could provide alternative results and potentially additional conclusions (Washington et al., 2020; Ahmed et al., 2023). The study of worker commuting behavior and its relation to metropolitan characteristics is left for further research.

Despite these limitations, results may be relevant for planners, as we present evidence of the impact of living environment on older people as drivers, pedestrians/cyclists, and public transit riders. Given the negative consequences of commuting, those who live in metropolitan and densely-populated area devote more time to commuting and such differences may lead to health inequalities. Furthermore, policy makers should target densely populated regions, as elder workers in those areas appear to be subject to longer commutes. For instance, reduction of housing costs or policies favoring housing rentals may help to improve workers' residence location and, consequently, reduce their commuting trips. Moreover, MSA sizes are positively related to the use of public transport, but no differences are found in driving or active commuting, which may indicate that newer modality styles (e.g. car/bike-sharing schemes) may have a limited impact on commuting patterns of older workers. Because the scope of the analysis is until 2018, these conclusions are subject to temporal heterogeneity, but also to the impact of major events, such as the recent COVID-19 pandemic. For instance, Semple et al. (2023) report that the pandemic affected travel patterns of Scottish elder workers. The analysis of how the COVID-19 relates to travel behaviors of US senior workers in metropolitan and non-metropolitan areas, and the potential differences between workers in these areas, and in terms of metropolitan population size. This includes, for instance, studies of work-from-home practices, the use of transport modes that enhance isolation. These studies are left for future analysis.

Acknowledgements

This paper has benefitted from funding from the following projects: PID2019:108348RA-I00 (Spanish Ministry of Science and Innovation), JIUZ-2019-SOC-09 (Ibercaja), and S32_23R (Government of Aragón).

References

Aguiar, M. and Hurst, E. (2007) Measuring trends in leisure: The allocation of time over five decades. *The Quarterly Journal of Economics*, 122(3), 969-1006.

Ahmed, S.S., Fountas, G., Anastasopoulos, P.C. and Peeta, S. (2023) Analysis of urban travel time and travel distance: A fully parametric bivariate hazard-based duration modelling approach with correlated grouped random parameters. *Travel Behaviour and Society*, 31, 271-283.

Beige, S. and Axhausen, K. W. (2017) The dynamics of commuting over the life course: Swiss experiences. *Transportation Research Part A: Policy and Practice*, 104, 179-194.

Bonke, J. (2005) Paid work and unpaid work: Diary information versus questionnaire information. *Social Indicators Research*, 70(3), 349-368.

Foster, G. and Kalenkoski, C.M. (2013) Tobit or OLS? An empirical evaluation under different diary window lengths. *Applied Economics*, 45(20), 2994-3010.
Frazis, H. and Stewart, J. (2012) How to think about time-use data: What inferences can we make about long-and short-run time use from time diaries? *Annals of Economics and Statistics*, 105/106, 231-245.
Gershuny, J. (2012) Too many zeros: A method for estimating long-term time-use from short diaries. *Annals of Economics and Statistics*, 105/106, 247-270.
Giménez-Nadal, J.I., Molina, J.A. and Velilla, J. (2021) Two-way commuting: Asymmetries from time use surveys. *Journal of Transport Geography*, 95, 103146.
Gimenez-Nadal, J.I., Molina, J.A. and Velilla, J. (2022) The daily mobility of older adults: Urban/rural differences in ten developed countries. *The Annals of Regional Science*, forthcoming.
Gottholmseder, G., Nowotny, K., Pruckner, G. J. and Theurl, E. (2009) Stress perception and commuting. *Health Economics*, 18, 559-576.
Hofferth, S.L., Flood, S.M., Sobek, M. and Backman, D. (2020) American Time Use Survey Data Extract Builder: Version 2.8. College Park, MD: University of Maryland and Minneapolis, MN: IPUMS.
Hu, L. and Schneider, R. J. (2017) Different ways to get to the same workplace: How does workplace location relate to commuting by different income groups? *Transport Policy*, 59, 106-115.
Kahneman, D. and Krueger, A. B. (2006) Developments in the measurement of subjective well-being. *Journal of Economic Perspectives*, 20(1), 3-24.
Kunn-Nelen, A. (2016) Does commuting affect health? *Health Economics*, 25(8), 984-1004.
Semple, T., Fountas, G. and Fonzone, A. (2023) Who is More Likely (Not) to Make Home-Based Work Trips During the COVID-19 Pandemic? The Case of Scotland. *Transportation Research Record*, 2677(4), 904-916.
Van Ommeren, J. N. and Van der Straaten, J. W. (2008). The effect of search imperfections on commuting behavior: Evidence from employed and self-employed workers. *Regional Science and Urban Economics*, 38(2), 127-147.
Velilla, J., Molina, J. A. and Ortega, R. (2018). Why elder workers become entrepreneurs? International evidence using fuzzy set methods. *The Journal of the Economics of Ageing*, 12(1), 88-95.
Washington, S., Karlaftis, M. G., Mannering, F. and Anastasopoulos, P. (2020) *Statistical and econometric methods for transportation data analysis*. CRC press.

Appendix A: Estimates of Tobit models not included in the text

Table A1. Tobit estimates on commuting time

	(1)	(2)	(3)	(4)
	Women		Men	
Variables	**Metrop.**	**MSA size**	**Metrop.**	**MSA size**
Metropolitan area	0.279***		0.245***	
	(0.077)		(0.083)	
MSA sizes:				
100,000-249,999		0.062		0.183
		(0.112)		(0.121)
250,000-499,999		0.253**		0.030
		(0.105)		(0.115)
500,000-999,999		0.256**		0.230**
		(0.103)		(0.115)
1,000,000-2,499,999		0.304***		0.385***
		(0.094)		(0.098)
2,500,000-4,999,999		0.263**		0.296***
		(0.109)		(0.113)
5,000,000+		0.439***		0.370***
		(0.112)		(0.117)
All controls and constant	Yes	Yes	Yes	Yes
Observations	5,415	5,415	5,697	5,697

Note: Robust standard errors in parentheses. The sample (ATUS 2003-2018) is restricted to employed workers aged 55 or more, and working days. Estimates computed using sample weights. The dependent variable is the log-of-commuting time. *** Significant at the 1%; ** significant at the 5%; * significant at the 10%.

Table A2. Tobit estimates on transport modes

	(1)	(2)	(3)	(4)	(5)	(6)
		Women			Men	
Variables	**Rate private**	**Rate active**	**Rate public**	**Rate private**	**Rate active**	**Rate public**
Metropolitan area	-0.012	-0.006	0.011*	-0.003	0.000	0.008
	(0.011)	(0.007)	(0.006)	(0.010)	(0.007)	(0.005)
All controls and constant	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,401	4,401	4,401	4,514	4,514	4,514
MSA sizes:						
100,000-249,999	0.008	-0.015	0.002	0.005	-0.001	0.003
	(0.017)	(0.010)	(0.009)	(0.015)	(0.010)	(0.008)
250,000-499,999	-0.008	-0.009	0.009	0.008	0.006	-0.003
	(0.015)	(0.009)	(0.008)	(0.014)	(0.009)	(0.007)
500,000-999,999	0.021	-0.013	-0.003	0.021	-0.006	-0.004
	(0.015)	(0.009)	(0.008)	(0.014)	(0.009)	(0.007)
1,000,000-2,499,999	-0.004	-0.007	0.006	-0.008	0.005	0.006
	(0.013)	(0.008)	(0.007)	(0.012)	(0.008)	(0.006)
2,500,000-4,999,999	-0.032**	-0.008	0.036***	-0.028**	-0.006	0.023***
	(0.015)	(0.009)	(0.008)	(0.014)	(0.009)	(0.007)
5,000,000+	-0.119***	0.020**	0.071***	-0.032**	-0.003	0.038***
	(0.016)	(0.010)	(0.009)	(0.014)	(0.010)	(0.007)
All controls and constant	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,401	4,401	4,401	4,514	4,514	4,514

Note: Robust standard errors in parentheses. The sample (ATUS 2003-2018) is restricted to employed workers aged 55 or more and working days. Workers who report zero commuting are excluded. Estimates computed using sample weights. *** Significant at the 1%; ** significant at the 5%; * significant at the 10%.