

62nd ERSA Congress 2023

“Urban challenges and Sustainable Technological Revolution”

Alicante, 28th August– 01th September 2023

Sustainable home-work commuting in Italy.

What are the successful factors for the shift toward green mobility?

Irina Di Ruocco¹, Daniele Crotti², Elena Maggi¹

¹*Department of Economics, University of Insubria*

²*Department of Human Sciences and of the Innovation for the Territory, University of Insubria*

G34.Transport and Accessibility/G40. Spatial Econometrics

Abstract

The relationship between commuting to work and its impact on psycho-physical conditions is still a hot topic in academic research, and efforts are underway to understand how to balance this transport-based aspect with individual sustainability and well-being goals. Current national reports display that commuting improves sustainability and reduces polluting emissions; however, especially in the Italian context, the association between well-being and use of bikes to reach work places has still been devoted a scarce attention in the literature.

To fill this gap, this study focuses on the aspects of mobility of Italian citizens and their habits when commuting to work. The main twofold objective is to identify which are the main factors driving the choice to use bikes to get to work places and to study whether that decision could have a positive impact on well-being and health conditions. To do so, in this paper a recursive econometrical mixed-method is applied, where national data about commuting preferences and the potential use of the bicycle as a travel mode are studied. Primer findings reveal that using bikes to commute to work might reduce the probability to report psychological states of unhappiness.

Keywords: *Bike-to-work; Green mobility; Cycling infrastructure; Mixed-method approach; Well-being.*

Introduction

Many studies have questioned the role of bike-to-work programs in relation to socioeconomic (Shbeeb, 2023), political, and environmental aspects of urban space or in relation to the Covid-19 pandemic (Faber et al., 2023; Huang et al., 2023). Most research seeks to analyse the demand for mobility or focuses on the characteristics of subjective/objective well-being in relation to commuting (Keumi, 2023). Other academics have analysed commuting in relation to a set of

factors, such as built environment, or with large-scale urban character policies (Hook et al., 2023; European Council, 2019; Handy et al., 2014).

Recent literature suggests that bicycle infrastructures are important determinants of bicycle commuting, and that the presence of bicycle networks can stimulate local economies and motivate users to bicycle to work (Legambiente, 2018). In Italy, although cycling infrastructure in major cities improved by about 50% between 2008 and 2015, the percentage of cyclists commuting to work by bicycle remained unchanged at 3.6% on average (Sottile et al., 2021) and there are still few studies that relate mobility choices to cycling infrastructure and travel behaviour.

Analysis of personal, attitudinal, and socioeconomic factors is critical to drive the environmental change that also occurs in commuting to work and to understand spatial dynamics. Such motivations are still very limited in the literature and there are few case studies in Italy (Hu et al., 2023), adopting approaches to the choice of means of transport (Muñoz et al., 2016; WHO, 2018).

Physical activity is well recognized to have a variety of positive health effects (Warburton et al., 2006), but excessive sedentary behavior and inactivity have negative health effects (Tremblay et al., 2010; Götschi et al., 2016; Jones et al., 2016; Legrain et al., 2015). According to scholars' evidence, the subjective wellbeing and quality of life are consistently correlated (Bize et al., 2007; Willis et al., 2013).

Regular physical activity maintains and promotes physical and mental health. The World Health Organization recommends at least 150 minutes of moderate-intensity physical activity per week for adults aged 18 to her 64, but nearly 1 in 4 adults worldwide does not meet these recommendations (WHO, 2018).

Programs that address the sustainability of transportation networks are those that emphasize active and soft mobility and are in line with European recommendations for decarbonization and ecological transition. A shift in thinking toward sustainable cities is prompted by the end of major national programs in Italy. The 15-minute city actions that have been tested in several Italian and European cities are related to this paradigm. Understanding the connection between sustainable mobility (soft and active) and the 15-minute city is necessary to reduce spatial disparities in people's essential travel, such as the home-to-work commute.

The emphasis on commuting to work has covered broader areas of the literature, such as the association with well-being, travel satisfaction (Willis et al., 2013) and quality of life, combining aspects of economic supply with socio-economic indicators, work, the environment, psychological factors, and user propensity towards green measures. These factors help to better understand the scope and importance of sustainable transport initiatives implemented by governments and to assess potential future scenarios for environmentally friendly bike-to-work programmes. Analysis of recent studies reveals notable differences between the choice of green and soft mobility and the level of user happiness and well-being, both at the urban and suburban level, but particularly in significant Italian metropolitan areas that still do not have a sustainable mobility system. To have an intermodal offer that is beneficial to users, it is important to understand the dynamics of individual choice and the presence of an active and functional LPT network.

Understanding preferences in travel choices and the impact on travel happiness has also attracted attention recently, as travel patterns and satisfaction vary by urban context, economic level, and country. Furthermore, as emphasized in (Hu et al., 2023; MIT, 2019), the level of travel satisfaction is significantly associated with the perception of the environment and traffic congestion during travel, and this effect differs between women and men. Only a few pioneering cities in Italy have a bike commute programme. At a global and European level, the BTW is in line with Sustainable Development Goals, in particular SDG No. 3 of Ensure healthy lives and promote well-being for all at all ages and No. 11 Make cities and human settlements inclusive, safe, resilient and sustainable, European Guidelines for Green Transition, and in this context the promotions on mobility concern incentives to use public transportation or active modes for commuting to work and incentives to invest in cycling infrastructure (e.g., bike lanes, safe paths, dedicated signs).

The importance of the bicycle-to-work theme is reflected in the numerous interventions of the Italian Ministry of Sustainable Infrastructure within the Recovery Plan (Wild et al., 2019), which aim to strengthen bicycle mobility and its dissemination within urban centres and to reduce the climate-determining emissions of transport, in line with the principles of the ecological transition. The presence of sustainable mobility as a central theme of the ecological transition shows that the promotion of cycling as an environmentally friendly means of transport is an element that seeks to combine the reduction of climate-changing emissions, the increase of people's health and the promotion of a different city model. Furthermore, there is no Italian national study comparing regions and relevant elements in time and space. While there is still a lack of awareness that the choice to support bike-to-work is also an instrument of action driven at the level of corporate policies.

In Italy the appointed Ministry of Transports has launched in 2019 the Home-Work Travel Plan (PSCL)¹ as a tool for analysing, developing, and verifying a set of measures to rationalise home-to-work travel, with the main objective of the PMA is to find solutions to decrease as much as possible the number of employees using private vehicles for the home-work-work journey. This is an environmental issue that involves aspects that affect personal life as well as economic and social life. The plan examines the organisation of company work, internal logistics and the accessibility of the workplace with respect to transport services, road connections and access to the premises or plant.

Active transportation, like walking or cycling, has a good impact on a person's physical and mental well-being. Compared to other forms of transportation, active commuting is thought to be more enjoyable, relaxing, and stress-free, with cyclists being the happiest commuters (Hamer and Chida, 2008). Active commuting is linked to several objective health markers, including a decreased risk of cardiovascular disease (Flint et al., 2014) and a decreased likelihood of being overweight (Tajalli & Hajbabaie, 2017; Jacob et al., 2021). The relationship between active commuting and subjective health, which is a person's self-reported assessment of their general health, has, however, received less attention (Stanojević Jerković et al., 2017).

With this premise, the goal of this paper is to analyze the relationship between commuting by active modes of transport, on the one hand, and the health status of individuals travelling to/from work. We use data from the ISTAT "Aspects of Daily Life" Multipurpose national survey for the year 2020. We estimate mixed-process models, considering two measures of health:

¹ <https://www.mase.gov.it/pagina/piano-spostamenti-casa-lavoro-del-15-novembre-2022>

subjective health, captured by a self-reported assessment of the individual's general health status, and that individual's possession of bike. Our main variables of interest are the use of bike for work trips and the happy status.

Our contribution to the literature has two parts. First, we add to the limited body of research on active commuting and subjective health in Italy, enhancing the body of knowledge worldwide on the connection between well-being and bicycle use. Subjective health encompasses implicitly both individual and societal attitudes and behaviours in addition to the biological, mental, social, and functional components of one's own health (Roberts et al., 2011). However, there is limited proof of its connection to active commuting, despite its potential as a measure of integrated health (Putnam, 2000). The background for bike-to-work as home-work sustainability strategies are being established in Italy, so we give evidence for that country in our second section. Further research is required to better understand any potential associations between walking and cycling and personal health because physical transportation for commuting is not widespread or a natural option in Italy.

Literature review

The Bike to Work “BTW” aims to promote cycling as a healthy, environmentally friendly, and energy-efficient means of transport. In recent years, research on how commuting impacts employees has expanded. Longer commutes are linked to more sick days, which can result in higher labour expenses and productivity losses as well as poorer levels of happiness and life satisfaction. The research evaluating the impacts of commuting on health outcomes has examined a range of health indicators. For instance, evidence suggests that travel is bad for one's mental health (Wang et al., 2019). Numerous factors can affect how commuters' mental health may be impacted, including decreased social engagement (Evans et al., 2002), depression brought on by prolonged traffic delays (Mytton et al., 2016), stress brought on by unpredictability (Clark et al. 2020; Fordham et al., 2018), and traffic congestion. The relationships between active travel and subjective well-being and quality of life are less well understood, and most studies conducted so far have only investigated a small number of outcomes. Walking has been linked to greater life satisfaction when compared to using a vehicle to commute, while cycling has been linked to fewer sick days, improved mental health, and a decreased risk of feeling stressed (Gimenez-Nadal and Molina, 2019). However, there are still large gaps in the information about the relationships between active commuting and measures of wellbeing and quality of life. For instance, a recent review of the literature found that although bicycles and walkers report higher levels of subjective wellbeing, no consistent relationship between the mode of transportation and life satisfaction has been established, highlighting the need for additional study (Gatersleben and Uzzell, 2007). Few research examined how gender may potentially moderate the relationship between active commuting and measures of subjective wellbeing.

Empirical evidence associate that the poorer sleep quality are factors in the increased fatigue that comes with commuting. In turn, commuting has also been connected to these health effects given that both exhaustion and stress can result in cardiovascular irregularities and heart dysfunction. Additionally, commuting has a detrimental impact on subjective health, which is defined as one's self-reported assessment of general health or level of health satisfaction (Wener and Evans, 2011; Van Ommeren and Gutiérrez-i-Puigarnau, 2011; Giménez-Nadal et al.,

2022; Hansson et al., 2011). Given that some of the negative effects of commuting may be worsened when using private transportation, the bulk of past analyses concentrate on commuting regardless of mode of transportation, or on commuting by automobile. Compared to other modes of transportation, driving to work is thought to be more stressful and uninteresting (Künn-Nelen, 2016, Ettema et al., 2010).

Van Ommeren and Gutiérrez-i Puigarnau (2011) investigating whether the commute has a good or negative impact on absenteeism, hypothesizing that the length of the worker's commute has a negative impact on productivity. The study proposed by Wild and Woodward (2019) highlighted the status of cyclists and their happiness commuting condition. The highest levels of pleasure with the commute to work are frequently reported by cyclists, although the causes of this contentment are yet unknown. We contend that efforts to "bring back the bike" will depend just as much on a strong appreciation of its pleasures as its dangers since exercise research highlights the crucial role that pleasure plays in motivating people to engage in and sustain physical activity.

(Giménez-Nadal and Velilla, 2022) analysed current trends in commuting and the variables influencing commuting behavior, examining the factors that affect commute time in more detail, revealing some variation in commuter behaviour since different factors affect commute time in different nations. The work looks at the amount of time workers spent traveling to and from work over the course of the last three decades in fifteen European nations. The results show that there is a significant gender gap in the amount of time spent commuting in Austria, Belgium, France, Germany, Italy, Ireland, Luxembourg, the Netherlands, and the United Kingdom, with male workers spending more time commuting than female workers do.

Commute time has been connected to several unfavourable effects. In Sweden and the UK, respectively, Diener and Lucas (2000) and Dickerson et al. (2014), Kahneman et al., (2004), Kahneman & Krueger (2006) discovered a negative association between commuting and health outcomes. The commute to work may have an impact on both the cognitive and emotive aspects of happiness (Gottholmsede et al., 2009; Wener et al., 2003). The journey to work may nevertheless be stressful, even though it typically has an anticipated positive outcome, which would consequently have a favourable impact on the cognitive component of happiness. Thus, commuters' affective responses should also be taken into consideration, regardless of whether they are primarily stressed, at ease, excited, or bored. Considering this, Diener and Lucas (2000) recommended that assessments of the emotive aspects of pleasure should be grounded in a dimensional description that varies in valence and activation.

Longer commuters in the UK have been found to have lower subjective and psychological wellbeing, according to Martin et al. (2014). Stutzer and Frey (2008), Novaco and Gonzalez (2009), Olsson et al. (2013) and Martin et al. (2014) discovered that commuting ranks among the least enjoyable activities in terms of "instant enjoyment", and several authors have discovered that commuting is linked to increased stress (Herman and Larouche, 2021; Wild and Woodward, 2019; Roodman, 2011; Webel, 2011).

According to prior research on active commuting, it is positively correlated with both the mental and physical aspects of a person's health (Clougherty et al., 2016). On the one hand, active transportation is thought to be more enjoyable, thrilling, and less stressful than other forms of transportation. Additionally, active commuting is linked to greater work-life balance and subjective well-being.

Herman and Larouche (2021) analysed the active commuting to work in relation to subjective well-being, happiness, and work-life balance in relation to the users' state of happiness. According to research, a large portion of people define happiness as their ability to make their daily routines function in a way that support pleasant feelings over those brought on by inconveniences. In agreement with this, a poll of commuters in Sweden's three largest cities reveals that pleasure at home and at work is correlated. Additionally, it has been discovered that moods are mainly good or neutral during commutes. Walking and biking provide healthy physical activity, and short trips operate as a barrier between the work and personal spheres. These may be explanatory variables. Social and recreational activities either boost beneficial effects or offset negative effects of long journeys. Clougherty et al. (2016) found that the women were considerably less likely to report having a bad work-life balance if they actively commuted. While women who took public transportation were more likely to express life discontent, active commuter women were also less likely to report significant levels of life stress. The mode of transportation was not significantly related to either the self-rated physical or mental wellbeing.

Data & Methodology

The research aims to analyse the role of commuting in Italy throughout the Italian territory by using a public dataset provided by STAT "Aspects of daily life" and comparing it with a multipurpose national survey. Selected individuals are asked to answer various questions of daily life, among which there are sections relating to transport, the use of sustainable means and alternatives to the car, the use and possession of bicycles, the presence of parks in one's neighbourhood, the ease of reaching common destinations. The selected sections are part of the socio-economic, health, well-being, transport sub-sectors.

The 2020 wave collected information on 42,840 individuals (24,000 households) and on 755 indicators, 754 questions grouped by sector. We focused on workers aged 18 and over 15,341 observations. The two main variables indicate the use of bikes to reach workplaces (i.e., a binary variable labelled as BTW_i) and the self-reported state of

happiness of the respondents captured by the question: "*How many times have you felt happy in the last 4 weeks?*" and labelled as $HAPPY_i$.

The methodology is a recursive mixed-method approach, in which we first identify an instrumental variable to avoid endogeneity issues. Specifically, we use the variable indicating the bike ownership (labelled as $Bike_i$) as the respondents' choice to use bikes to commute to work does potentially lack of exogenous predictors with respect to their self-reported happiness, leading to an endogeneity error (Roodman, 2011; Webel, 2011). The chosen instrumental variable affects the decision to commute by bike but, in principle, does not influence own happiness.

Regarding the question "*How many times have you felt happy in the last 4 weeks?*" the $HAPPY_i$ variable is an ordered variable, with Likert scale response ranging from 1/Always to 6/Never. The dataset shows that 3% of the 18+ workers interviewed use the bicycle to get to the workplace. The joint estimation of two equations considers that:

1. One equation includes the choice of bike-to-work as a dependent variable (BTW_i);

- The other one includes it as an explanatory variable for the level of self-reported state of happiness of surveyed workers ($HAPPY_i$).

The resulting two-equation *recursive* system is described as follow:

$$\begin{cases} BTW_i^* = \alpha_0 + \alpha_1 \times Bike_i + \alpha'X_i + \varepsilon_{i,BTW} \\ HAPPY_i = \beta_0 + \beta_1 \times BTW_i + \beta'X_i + \varepsilon_{i,HAPPY} \end{cases} \quad (1)$$

where $BTW_i = 1$ if $BTW_i^* > 0$, and 0 otherwise.

Results

The results show a first attempt to correlate the use of the bike with the state of happiness in the use of the bike to go to work. The instrumental variable ($Bike_i$) is a binary response (YES/NO) to the question “Do you own at least one bicycle?” with 67% of respondents owns a bike, and the descriptive statistic is shown in the Table 1 below.

Table 1 - Descriptive statistics

		Bike	
		1/Yes	0/No
BTW	1/Yes	440	17
	0/No	9,793	5,091
Spearman rank correlation		$\rho = 0.11, p < 0.0001$	

The results of applying the model show a positive correlation between BTW and happiness status. As shown in Table 2, bike ownership is positively correlated with the state of happiness, and for the age group between 45 and 4 years, while less for the 30-34 years.

About socioeconomic conditions, the job position and workplace location are significant influencing the choice of bike for BTW and for the state of happiness (negative correlation).

The location of the workers' housing and their employment are important factors in both the bike-to-work (BTW) and self-reported happiness (HAPPY) measures.

Being alien increases the likelihood of BTW and decreases the likelihood of feeling unhappy.

We discover evidence that using a bike to travel to work may reduce the likelihood of reporting depressive feelings after accounting for several circumstances.

Explanatory variables	Dependent variables			
	Bike-to-work (BTW)		Self-reported happiness (HAPPY)	
	Coeff.	Std. err.	Coeff.	Std. err.
<i>Bike-to-work (BTW)</i>				
ref.: 0/No				
1/Yes			-0.45*	0.22
<i>Instrumental variable (IV)</i>				
<i>Bike</i>				
ref.: 0/No (97.0%)				
1/Yes (3.0%)	1.04***	0.10		
<i>Gender</i>				
ref.: Male (57.1%)				
Female (42.9%)	-0.10	0.05	0.10***	0.02
<i>Age</i>				
ref.: 35-39 (31.4%)				
18-19 (0.2%)	0.58	0.32	-0.10	0.19
20-24 (3.5%)	-0.17	0.14	-0.11*	0.05
25-29 (15.6%)	0.01	0.07	-0.04	0.03
30-34 (24.0%)	-0.02	0.06	-0.09***	0.02
40-44 (14.2%)	-0.01	0.08	0.04	0.03
45-49 (8.1%)	0.03	0.10	0.08*	0.04
50-54 (2.8%)	-0.13	0.20	-0.01	0.06
55-59 (0.2%)	N/A	Omitted	-0.05	0.19
<i>Nationality</i>				
ref.: Italian (93.7%)				
Foreign (4.9%)	0.29**	0.10	-0.12**	0.05
N/A (1.5%)	0.35*	0.18	-0.10	0.08
<i>Macro-geographical residence</i>				
ref.: North-West (24.5%)				
North-East (24.3%)	0.33***	0.06	-0.08**	0.03
Centre (19.9%)	-0.24**	0.08	0.06*	0.03
South (23.6%)	-0.32***	0.08	-0.09***	0.02
Islands (7.7%)	-0.29*	0.13	-0.13***	0.04
<i>Job position</i>				
ref.: White collar (41.0%)				
Manager/Chief Executive (13.6%)	-0.26**	0.09	0.11***	0.03
Blue collar (32.8%)	0.03	0.06	0.12***	0.02
Professional/Freelance (12.5%)	-0.22*	0.09	0.08**	0.03
N/A (0.1%)	N/A	Omitted	N/A	Omitted
<i>Workplace location</i>				
ref.: Same town of the residence province (59.9%)				
Different town in the residence province (40.1%)	-0.32***	0.03	-0.01	0.01
<i>Physical limitations (in the last 6 months)</i>				
ref.: Absent (80.4%)				
Weak (12.9%)	-0.15	0.22	0.19**	0.07
Strong (1.7%)	0.06	0.07	0.04	0.03
N/A (5.0%)	N/A	Omitted	N/A	Omitted

Figure 1 – Results of mixed approach

Conclusions

The present research shows an advance in the literature for bike to work and if there are positive effects on health to induce local and regional authorities to reflect more on this possibility and launch more intense programs to promote BTW. This research is empirically included in the gaps highlighted by the literature on the role between BTW and state of well-being and is in line with the results highlighted (58, 62) representing the first example for the case Italian to provide an analysis of a national geographical area. Commuting in Italy is moving towards sustainable directions, launching measures to encourage commuting from home to work in a sustainable way and for workers who are at short and medium distances. This research addresses the issue also considering related variables that can influence the choice of bike, considering that Italy is geographically very different and that some cities are more favourable than others, in particular the north-east responds well to the btw while the south still struggles with such measures.

References

- (1) Shbeeb, L. (2023). How Do The Socio-Economic Indicators Influence The Travel Behaviour Pattern? Case Study Amman-Jordan. *Journal Of Applied Engineering Science*, 21(1)
- (2) Faber, R. M., Hamersma, M., Brimaire, J., Kroesen, M., & Molin, E. J. (2023). The relations between working from home and travel behaviour: a panel analysis
- (3) Huang, Z., Loo, B. P., & Axhausen, K. W. (2023). Travel behaviour changes under Work-from-home (WFH) arrangements during COVID-19. *Travel Behaviour and Society*, 30, 202-211.
- (4) Keumi, C. (2023). Understanding the Relationship Between Daily Travel and Long-Term Subjective Well-Being. In *Current Issues in Public Utilities and Public Policy: Empirical Studies Focusing on Japan* (pp. 149-190). Singapore: Springer Nature Singapore
- (5) Hook, H., De Vos, J., Van Acker, V., & Witlox, F. (2023). A comparative analysis of determinants, characteristics, and experiences of four daily trip types. *Travel Behaviour and Society*, 30, 335-343
- (6) European Council (2019), A new strategic agenda 2019-2024 (<https://www.consilium.europa.eu/media/39914/a-new-strategic-agenda-2019-2024.pdf>)
- (7) Handy, S., van Wee, B., Kroesen, M. (2014), Promoting cycling for transport: research needs and challenges, *Transport Reviews*, 34(1): 4-24
- (8) Legambiente (2018), 2nd Report on Bike Economy and Urban Cycling in Italy (https://www.legambiente.it/wp-content/uploads/a_bi_ci_2018.pdf)
- (9) Sottile, E., Piras, F., Calli, D., Meloni, I. (2021), Why don't Italians cycle to work? An experimental analysis, *Case Studies on Transport Policy*, 9(1):362-373
- (10) Hu, Y., Sobhani, A., & Ettema, D. (2023). Are men or women happier commuters? A study on the determinants of travel mode dissonance and travel satisfaction for dual-earner couples with school-age children in Ganyu, China. *Travel Behaviour and Society*, 31, 131-140
- (11) Muñoz, B., Monzon, A., Daziano, R. A. (2016), The Increasing Role of Latent Variables in Modelling Bicycle Mode Choice, *Transport Reviews*, 36(6):737-771
- (12) World Health Organization. *The global action plan on physical activity 2018–2030: more active people for a healthier world*. Geneva: World Health Organization, 2018.
- (13) Warburton, D. E., Nicol, C. W., & Bredin, S. S. (2006). Health benefits of physical activity: the evidence. *Cmaj*, 174(6), 801-809.
- (14) Tremblay, M. S., Colley, R. C., Saunders, T. J., Healy, G. N., & Owen, N. (2010). Physiological and health implications of a sedentary lifestyle. *Applied physiology, nutrition, and metabolism*, 35(6), 725-740.
- (15) Götschi, T., Garrard, J., & Giles-Corti, B. (2016). Cycling as a part of daily life: a review of health perspectives. *Transport Reviews*, 36(1), 45-71.
- (16) Jones, T., Harms, L., & Heinen, E. (2016). Motives, perceptions and experiences of electric bicycle owners and implications for health, wellbeing and mobility. *Journal of transport geography*, 53, 41-49.
- (17) Legrain, A., Eluru, N., & El-Geneidy, A. M. (2015). Am stressed, must travel: The relationship between mode choice and commuting stress. *Transportation research part F: traffic psychology and behaviour*, 34, 141-151.
- (18) Bize, R., Johnson, J. A., & Plotnikoff, R. C. (2007). Physical activity level and health-related quality of life in the general adult population: a systematic review. *Preventive medicine*, 45(6), 401-415.

- (19) Hamer, M., & Stamatakis, E. (2010). Objectively assessed physical activity, fitness and subjective wellbeing. *Mental Health and Physical Activity*, 3(2), 67-71.
- (20) Willis, D. P., Manaugh, K., & El-Geneidy, A. (2013). Uniquely satisfied: Exploring cyclist satisfaction. *Transportation research part F: traffic psychology and behaviour*, 18, 136-147.
- (21) Ministero delle Infrastrutture e dei Trasporti (2019). Decreto Proposta Pinqua (Programma Innovativo Nazionale per la Qualità dell’Abitare (PinQua)) (<https://www.mit.gov.it/nfsmitgov/files/media/notizia/2021-10/Decreto%20su%20graduatoria%20PINQUA.pdf>)
- (22) Wild, K., & Woodward, A. (2019). Why are cyclists the happiest commuters? Health, pleasure and the e-bike. *Journal of Transport & Health*, 14, 100569.
- (23) Hamer, M., & Chida, Y. (2008). Active commuting and cardiovascular risk: a meta-analytic review. *Preventive medicine*, 46(1), 9-13.
- (24) Flint, E., Cummins, S., & Sacker, A. (2014). Associations between active commuting, body fat, and body mass index: population based, cross sectional study in the United Kingdom. *Bmj*, 349.
- (25) Tajalli, M., & Hajbabaie, A. (2017). On the relationships between commuting mode choice and public health. *Journal of Transport & Health*, 4, 267-277.
- (26) Jacob, N., Munford, L., Rice, N., & Roberts, J. (2021). Does commuting mode choice impact health?. *Health economics*, 30(2), 207-230.
- (27) Stanojević Jerković, O., Sauliūnė, S., Šumskas, L., Birt, C. A., & Kersnik, J. (2017). Determinants of self-rated health in elderly populations in urban areas in Slovenia, Lithuania and UK: findings of the EURO-URHIS 2 survey. *The European Journal of Public Health*, 27(suppl_2), 74-79.
- (28) Roberts, J., Hodgson, R., & Dolan, P. (2011). “It’s driving her mad”: Gender differences in the effects of commuting on psychological health. *Journal of health economics*, 30(5), 1064-1076.
- (29) Putnam, R. D. (2000). *Bowling alone: The collapse and revival of American community*. Simon and schuster.
- (30) Wang, X., Rodríguez, D. A., Sarmiento, O. L., & Guaje, O. (2019). Commute patterns and depression: Evidence from eleven Latin American cities. *Journal of Transport & Health*, 14, 100607.
- (31) Evans, G. W., Wener, R. E., & Phillips, D. (2002). The morning rush hour: Predictability and commuter stress. *Environment and behavior*, 34(4), 521-530.
- (32) Mytton, O. T., Panter, J., & Ogilvie, D. (2016). Longitudinal associations of active commuting with body mass index. *Preventive medicine*, 90, 1-7.
- (33) Clark, B., Chatterjee, K., Martin, A., & Davis, A. (2020). How commuting affects subjective wellbeing. *Transportation*, 47, 2777-2805.
- (34) Fordham, L., van Lierop, D., & El-Geneidy, A. (2018). Examining the relationship between commuting and it’s impact on overall life satisfaction. *Quality of life and daily travel*, 157-181.
- (35) Gimenez-Nadal, J. I., & Molina, J. A. (2019). Daily feelings of US workers and commuting time. *Journal of Transport & Health*, 12, 21-33.
- (36) Gatersleben, B., & Uzzell, D. (2007). Affective appraisals of the daily commute: Comparing perceptions of drivers, cyclists, walkers, and users of public transport. *Environment and behavior*, 39(3), 416-431.
- (37) Wener, R. E., & Evans, G. W. (2011). Comparing stress of car and train commuters. *Transportation Research Part F: Traffic Psychology and Behaviour*, 14(2), 111-116.
- (38) Van Ommeren, J. N., & Gutiérrez-i-Puigarnau, E. (2011). Are workers with a long commute less productive? An empirical analysis of absenteeism. *Regional Science and Urban Economics*, 41(1), 1-8.
- (39) Giménez-Nadal, J. I., Molina, J. A., & Velilla, J. (2022). Trends in commuting time of European workers: A cross-country analysis. *Transport Policy*, 116, 327-342.
- (40) Hansson, E., Mattisson, K., Björk, J., Östergren, P. O., & Jakobsson, K. (2011). Relationship between commuting and health outcomes in a cross-sectional population survey in southern Sweden. *BMC public health*, 11, 1-14.
- (41) Künn-Nelen, A. (2016). Does commuting affect health?. *Health economics*, 25(8), 984-1004.
- (42) Ettema, D., Gärling, T., Olsson, L. E., & Friman, M. (2010). Out-of-home activities, daily travel, and subjective well-being. *Transportation Research Part A: Policy and Practice*, 44(9), 723-732.
- (43) Diener, E., & Lucas, R. E. (2000). Explaining differences in societal levels of happiness: Relative standards, need fulfillment, culture, and evaluation theory. *Journal of happiness studies*, 1, 41-78.
- (44) Dickerson, A., Hole, A. R., & Munford, L. A. (2014). The relationship between well-being and commuting revisited: Does the choice of methodology matter?. *Regional Science and Urban Economics*, 49, 321-329.
- (45) Kahneman, D., Krueger, A. B., Schkade, D. A., Schwarz, N., & Stone, A. A. (2004). A survey method for characterizing daily life experience: The day reconstruction method. *Science*, 306(5702), 1776-1780.

- (46) Kahneman, D., & Krueger, A. B. (2006). Developments in the measurement of subjective well-being. *Journal of Economic perspectives*, 20(1), 3-24.
- (47) Gottholmseder, G., Nowotny, K., Pruckner, G. J., & Theurl, E. (2009). Stress perception and commuting. *Health economics*, 18(5), 559-576.
- (48) Wener, R. E., Evans, G. W., Phillips, D., & Nadler, N. (2003). Running for the 7: 45: The effects of public transit improvements on commuter stress. *Transportation*, 30, 203-220.
- (49) Stutzer, A., & Frey, B. S. (2008). Stress that doesn't pay: The commuting paradox. *Scandinavian Journal of Economics*, 110(2), 339-366.
- (50) Novaco, R. W., & Gonzalez, O. I. (2009). Commuting and well-being. *Technology and well-being*, 3, 174-4.
- (51) Olsson, L. E., Gärling, T., Ettema, D., Friman, M., & Fujii, S. (2013). Happiness and satisfaction with work commute. *Social indicators research*, 111, 255-263.
- (52) Martin, A., Goryakin, Y., & Suhrcke, M. (2014). Does active commuting improve psychological wellbeing? Longitudinal evidence from eighteen waves of the British Household Panel Survey. *Preventive medicine*, 69, 296-303.
- (53) Herman, K. M., & Larouche, R. (2021). Active commuting to work or school: Associations with subjective well-being and work-life balance. *Journal of Transport & Health*, 22, 101118.
- (54) Roodman, D. (2011). Fitting fully observed recursive mixed-process models with cmp. *The Stata Journal*, 11(2), 159-206.
- (55) Webel, K. (2011). Greene, WH, Econometric Analysis. *Statistical Papers*, 52(4), 983.
- (56) Clougherty, J. A., Duso, T., & Muck, J. (2016). Correcting for self-selection based endogeneity in management research: Review, recommendations and simulations. *Organizational Research Methods*, 19(2), 286-347.