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ABSTRACT

Active Commuting and the Health of Workers*

Research has shown that commuting is related to the health of workers, and that mode choice may have differential effects on this relationship. We analyze the relationship between commuting by different modes of transport and the health status reported by US workers, using the 2014-2016 Eating and Health (EH) Module of the American Time Use Survey (ATUS). We estimate Ordinary Least Squares models on a measure of subjective health, that is the self-reported assessment of individual general health status, and on the body mass index. We find that longer commutes by bicycle are significantly related to higher levels of subjective health and to lower body mass index, while commuting by walking is weakly related to both health measures. We test the robustness of our results to possible measurement errors in commuting times, to the exclusion of compensating factors, and to the estimation method. We additionally instrument individual use of bicycles with an indicator of individual green attitudes, based on the General Social Survey (GSS), and the results consistently show that individuals who commute longer by bicycle report better subjective health and lower body mass index. Our results may help policy makers in evaluating the importance of having infrastructures that facilitate the use of bicycles as a means of transport, boosting investment in these infrastructures, especially in large cities.

JEL Classification: R40, I10, J22

Keywords: commuting, health, walking, cycling, American Time Use Survey

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1. Introduction

Commuting time in the United States has increased over recent decades (Gimenez-Nadal, Molina and Velilla, 2018). In 2019, the average one-way commute in the US reached 27.6 minutes, and a record 9.8% of commuters reported daily one-way travels to work of at least 1 hour. Despite recent efforts to promote more sustainable means of transportation, more than three-quarters of workers commute by driving alone (Burd et al., 2021). This fact is relevant for both public health and for employers, since the literature has shown that commuting by car has negative impacts on health. Travelling to work by private transport is perceived as more stressful and boring compared to other means of transportation (Gatersleben and Uzzell, 2007; Wener and Evans, 2011; Rissel et al., 2014), is associated with higher body mass index (Frank *et al.,* 2004; Lindström, 2008) and causes the most pronounced adverse effects on subjective health among passive commuters (Künn-Nelen, 2016).

In contrast, commuting by active means, such as walking or cycling, is positively related to both mental and physical dimensions of individual health (Jacob et al., 2021). For instance, active commuting is perceived to be more relaxing, engaging, and less stressful than other modes of transport (Gatersleben and Uzzell, 2007; Gottholmseder et al., 2009; Scheepers et al., 2014), with cyclists being considered as the happiest commuters (Wild and Woodward, 2019). Moreover, commuting by active means is associated with several objective measures of health, such as a lower likelihood of experiencing cardiovascular disease (Hamer and Chida, 2008) and a lower probability of being overweight (Lindström, 2008; Flint et al., 2014; Tajalli and Hajbabaie, 2017). However, a less explored link is that of active commuting and subjective health (Jacob et al., 2021), understood as individual self-reported evaluations of general health.

Within this framework, our objective 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. In doing so, we use data from the Eating and Health (EH) Module of the American Time Use Survey (ATUS) for the years 2014, 2015, and 2016. We estimate Ordinary Least Squares (OLS) models, considering two measures of health: subjective health, captured by a self-reported assessment of the individual’s general health status, and that individual's body mass index. Our main variables of interest are commuting times of walking and cycling.

We find that longer commutes are significantly associated with lower levels of subjective health status, while longer commutes by bicycle are significantly related to higher levels of subjective health and lower body mass index. In turn, commuting by walking is weakly related to both health measures, since the statistical significance changes in some of our robustness analyses. We test the sensitivity of our main results to possible measurement errors in reported commuting times, to the exclusion of compensating factors, and to the estimation method. Furthermore, we instrument commuting by bicycle to address the potential endogeneity of our main result – relatively healthy individuals may be in better shape to go to/from work by bicycle. Our instrument is obtained using information from the General Social Survey (GSS), from where we use a question on the degree of interest of individuals regarding environmental pollution issues (i.e., green attitudes) to compute average values for the 9 major areas of the United States. We find that individuals who commute longer by bicycle report higher subjective health and lower body mass index, which is consistent with our main results.

Our contribution to the literature is twofold. First, we contribute to the scant evidence analyzing active commuting and subjective health. Subjective health condenses several dimensions of personal health, such as biological, mental, social, and functional, and implicitly includes individual and cultural beliefs and behaviors (Stanojevic et al., 2017). Its use in medical research is widespread and it has been found to be a strong predictor of mortality (Idler and Benyamini, 1997; DeSalvo et al., 2006; Wuorela et al., 2020). However, and despite its potential as an integrated health measure, there is little evidence of its relationship to active commuting (Jacob et al., 2021). Second, we provide evidence for the United States, which represents an interesting case study. The United States has the fourth highest ratio of vehicles to inhabitants in the world (Myers, 2015) and the lowest prevalence of active travel among developed countries, which ultimately connects with also having among the highest rates of obesity (Bassett et al., 2008). Because active means of transport for commuting are not a common or natural choice in the US, more evidence is needed on the potential links between walking and cycling for commuting, and individual health, to better guide policies to promote active transportation.

The remainder of the paper is as follows. Section 2 presents a review of the literature. Section 3 presents the data and variables, Section 4 describes the empirical strategy, and Section 5 describes the results. Section 6 sets out our main conclusions.

2. Background

The study of how commuting affects workers has burgeoned in recent years. Longer commutes are associated with increasing sickness absence (van Ommeren and Gutiérrez-i Puigarnau, 2011, Gimenez-Nadal, Molina and Velilla, 2022), which may lead to increasing labor costs (Allen, 1983; Goodman et al., 2012) and losses of productivity (Grinza and Rycx, 2020), as well as to lower levels of well-being and life satisfaction (Stutzer and Frey, 2008; Dolan et al., 2008; Fordham et al., 2018; Friman et al., 2018; Gimenez-Nadal and Molina, 2019; Chatterjee et al., 2020).

The literature analyzing the effects of commuting on health outcomes has analyzed a range of health dimensions. For instance, evidence suggests that commuting is adversely related to psychological health (Roberts et al., 2011). Commuting may affect mental health through a variety of channels such as lower social participation (Putnam, 2000), depression from long traffic delays (Wang et al., 2019), and stress from unpredictability (Evans et al., 2002; Gottholmseder et al., 2009) and from traffic congestion (Hennessy and Wiesenthal, 1999). Moreover, commuting is associated with more fatigue (Lyons and Chatterjee, 2008; Gimenez-Nadal and Molina, 2019), possibly because of less nocturnal sleep (Walsleben *et al.*, 1999), reduced sleep time (Costal *et al.*, 1988) and lower sleep quality (Hansson *et al.,* 2011). In turn, given that both fatigue and stress may induce cardiovascular abnormalities and heart dysfunction, commuting has also been linked to these health outcomes (Koslowsky *et al.* 1995; White and Rotton, 1998). Additionally, commuting is negatively related to subjective health, understood as self-reported evaluation of general health or as satisfaction with health (Stutzer and Frey, 2008; Hansson *et al.*, 2011; Künn-Nelen, 2016).

However, the majority of prior analyses focuses on commuting irrespectively of mode of transport, or on commuting by car, given that some of the negative consequences of commuting may be exacerbated when travelling by private transport. Commuting by car is perceived as being more stressful and boring compared to other means of transportation

(Gatersleben and Uzzell, 2007; Wener and Evans, 2011; Rissel et al., 2014), and causes the most pronounced adverse effects on self-rated health among passive commuters (Künn-Nelen, 2016). Further, commuting by car is related to a higher body mass index (Frank *et al.,* 2004; Lindström, 2008). A different group of studies has shown that active modes of transport, such as commuting by bicycle or walking, may have beneficial effects on health.

Regarding active commuting, prior evidence has found that it is positively related to both mental and physical dimensions of individual health (Jacob et al., 2021). On the one hand, commuting by active means is perceived to be more relaxing, exciting, and less stressful than other modes of transport (Gatersleben and Uzzell, 2007; Gottholmseder et al., 2009; Scheepers et al., 2014). In turn, cyclists are usually considered the happiest commuters because they have a higher degree of control and arrival-time reliability, while feeling the positive effects of exercise and having more opportunities for social interaction (Wild and Woodward, 2019). Moreover, active commuting is positively associated with subjective well-being and a better work-life balance (Olsson et al., 2013; Martin et al., 2014; Herman and Larouche, 2021). On the other hand, active commuting leads to improvements in several objective measures of health, since it is associated with a lower likelihood of cardiovascular disease, compared to using private transportation (Hamer and Chida, 2008). Specifically, commuting by cycling is related to a lower risk of all-cause mortality and cancer (Celis-Morales et al., 2017), while walking to work is related to a lower probability of hypertension and diabetes (Laverty et al., 2013; Tajalli and Hajbabaie, 2017). In addition, studies have found a negative link between active commuting and being overweight (Lindström, 2008; Flint et al., 2014; Tajalli and Hajbabaie, 2017).

Despite the substantial evidence connecting active commuting and mental and objective health, a less explored link is that of active commuting and subjective health. Recent evidence for the UK indicates that mode switching in commuting, from public transport to active means significantly increases subjective health (Jacob et al., 2021).

3. Data and Variables

We rely on the Eating and Health (EH) Module in the American Time Use Survey (ATUS) for the years 2014, 2015, and 2016. The ATUS is the official time use survey of the US and is fielded from January through December of each year. The aim of this module is to collect data on time use and eating patterns, as well as nutrition, obesity, food and nutrition assistance programs, and grocery shopping and meal preparation. The main instrument of this survey is the time use questionnaire, in which diaries are completed by respondents on selected days, with each diary divided into time intervals where the respondent records a main activity, and other features, such as where the activity took place, and the mode of transport.[2]

Our interest is to analyze the relationship between commuting by active modes of transport and health, so we restrict our sample to individuals between the ages of 21 and 65 travelling to/from work (Aguiar and Hurst, 2007; Gimenez-Nadal and Sevilla, 2012) during working days, defined as those days where individuals devote at least 60 minutes to market work activities (Gimenez-Nadal and Molina, 2019; Gimenez-Nadal, Molina and Velilla, 2018a, 2018b; Molina et al., 2020). Our final sample amounts to 7,515 individuals.

We focus on two different types of health outcomes. First, we use subjective health captured by a self-reported assessment of the general health status of individuals, which ranges from 1 ("health is poor") to 5 ("health is excellent"). This is an interesting measure because it integrates several dimensions of individual health, such as biological, mental, social, and functional, and implicitly includes individual and cultural beliefs and behaviors (Stanojevic et al., 2017). According to this indicator, higher scores imply better health. Second, we use the body mass index (BMI), which reflects food consumption and health habits such as good nutrition and regular exercise (Reinhold and Jürges, 2010). For example, Christian (2012) finds for the US that more time spent in commuting is associated with reductions in health-related activities (i.e. physical activity, food preparation, time, eating with family, and sleeping). For this indicator, a higher index implies worse health.[3]

Panel (A) of Table 1 indicates that on a scale from 1 to 5, the average self-reported health is 3.7, which is almost a "very good" general health status. The most frequent answers are a very good health status (37.7%), a good health status (32.5%) and an excellent health status

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[2] The use of time surveys to analyze transportation behavior has increased in the last decade (Jara-Díaz and Rosales-Salas, 2015; Gimenez-Nadal et al., 2018a, 2018b, 2022; Echeverria et al., 2022).

[3] An individual with a body mass index over 25 is considered overweight, and over 30 is considered obese.

(20.3%). In turn, 14.2% of the sample reported poor general health, while 7.9% reported that it is fair. Moreover, the average body mass index is close to 28, meaning that, on average, individuals are overweight.

Our main variable of interest is the time in commuting, especially commuting by walking and by cycling. Commuting is defined as the time in minutes that the individual devotes to travel to/from work, considering all commuting episodes of his/her diary, irrespective of mode of travel. Analogously, commuting time walking (cycling) is defined as the time in minutes that the individual devotes to travel to/from work by walking (bicycle) in his/her diary.

Panel (B) of Table 2 shows that individuals commute, on average, 24.7 minutes per day. Despite that individuals devote almost half an hour to commuting, only 6.6% of them walk and less than 1% commute by bicycle. Individuals who walk spent on average 11.2 minutes commuting, while individuals who travel by bicycle spent on average 15.6 minutes commuting.

We also consider a set of controls to account for individual and family characteristics. We include age, gender, native status, highest education level achieved (primary, secondary or higher education), an indicator whether the person is a full-time employee, if living with a partner, household size, the number of children in the household, home ownership, and family income. These controls are common in the literature analyzing commuting behavior (Aguiar and Hurst, 2007; McQuaid and Chen, 2012; Gimenez-Nadal, Molina and Velilla, 2018a, 2018b) and its relationship with health outcomes (e.g., Stutzer and Frey, 2008; Roberts *et al.*, 2011; Hansson *et al.*, 2011; Rietveld *et al.*, 2014; Künn-Nelen, 2016).

Panel (C) of Table 1 describes the socio-demographic and family profile of our sample. We observe that commuters in the US are, on average, 41.5 years old, 57% are men, 81% are native, 7% have attained primary education, 27% secondary education, and 66% higher education. In addition, 87% are full-time employees. Regarding family structure, 57% of the sample live in couples, and families are composed, on average, of 3 members, including 1 child. Furthermore, 69% of individuals are home-owners, and 8% live in families with a total annual income below U$S 20,000, 27% in families with a total annual income between U$S 20,000 and U$S 50,000, and 65% in families earning more than U$S 50,000 a year.

4. Empirical Strategy

We are interested in the relationship between commuting via active modes of transport and health, for individuals travelling to/from work in the US, conditional on socio-demographic, family, and employment characteristics. We estimate Ordinary Least Squares (OLS) models at the individual-level, in which we consider two dependent variables to capture the health of individuals (H_i): i) one variable indicating the self-reported general health status of the individual, and ii) another for the body mass index of the individual. We estimate the following model:

$$H_i = \alpha + \beta CT_i + \gamma CT_i^2 + \theta CTW_i + \eta CTW_i^2 + \delta CTC_i + \lambda CTC_i^2 + \mu X_i + \rho FE_i + \varepsilon_i \quad (1)$$

where H_i is either the subjective health or the body mass index of individual i. The subjective health variable is standardized so that each estimated coefficient can be interpreted as the change in terms of one standard deviation of health (i.e., z-score). In this analysis, we treat subjective health as a continuous variable, so that coefficients can be interpreted as marginal effects. In the robustness analyses, we estimate an alternative model by performing an ordered logit model.

Our explanatory variables of interest are commuting times, in particular those of walking and cycling. CT_i and CT_i^2 denote the individual's commuting time (in minutes) and its square, regardless of mode of transport, while CTW_i and CTW_i^2 denote commuting time walking and its square, and CTC_i and CTC_i^2 commuting time cycling and its square. In order to evaluate the overall relationship between commuting time and health, we perform three F-tests for joint significance: on commuting time (joint test on β and γ), on commuting time walking (joint test on θ and η), and on commuting time cycling (joint test on δ and λ).

Lastly, X_i is a set of controls including age (and its square), gender, native status, education level (primary, secondary, or higher education), full-time employee, living in couple, household size, number of children in the household, home ownership, and family income. We incorporate a set of indicator variables to account for the occupation of the individual, using the categories included in the ATUS. Further, FE_i controls for state of residence, and month (January to December) and year (2014, 2015 or 2016) of the interview. Robust standard errors are estimated, and observations are weighted at the individual level using survey weights.

After estimating Equation (1), we perform several robustness checks to test the sensitivity of our main results. First, we estimate an alternative model to deal with possible measurement errors in reported commuting times. In particular, we treat commuting time as an ordinal measure by including a set of indicators for time intervals, similar to Künn-Nelen (2016), rather than as a continuous variable.[4] In addition, we estimate a model including two indicator variables to capture whether the individual commutes by walking or by cycling. Second, we exclude from the analysis variables through which individuals are potentially compensated for their longer commutes (i.e. income, full-time employment, and type of occupation). In the main analysis, we include these variables, following Hansson *et al.* (2011) and Roberts *et al.* (2011), because commuting can bring benefits in terms of higher incomes and better jobs that are likely to be associated with health outcomes. However, Stutzer and Frey (2008) argue that channels for compensation such as income or working hours should remain uncontrolled for, because if, for example, income is included, people who spend more time commuting are, ceteris paribus, worse off. Third, we alter the estimation method for the subjective health regression in order to treat it as an ordinal variable, by estimating an ordered logit model.

5. Results

Table 2 reports our main results from estimating Equation (1) at the individual-level. Panel (A) shows the results for subjective health and Panel (B) for the body mass index. In turn, Column (1) in all Panels refers to estimations including only the commuting time (and its square) as an independent variable, irrespective of mode of transport, while Column (2) in all Panels refers to estimations including also commuting time by walking and by cycling (and their squares). Because we include both commuting time and its square, Table 2 reports the F-statistics and *p*-values of the joint significance in all estimations. We show our main

[4] Time intervals are defined differently for overall commuting and commuting by walking and cycling, given the shorter times that individuals commute by active modes. We define time intervals as 0-15 minutes, 15-30 minutes, 30-45 minutes, 45-60 minutes and more than 60 minutes in the case of overall commuting. In turn, we define time intervals 0-5 minutes, 5-10 minutes, 10-15 minutes and more than 15 minutes in the case of walking and cycling.

parameters of interest in each table, and we also report the full set of estimates in the Appendix.

Estimates in Column (1) allow us to analyze commuting time without considering modes of transportation. However, because 94% of individuals commute by private transport, estimates of Column (1) are mainly driven by the use of the car. In Panel (A), results show a significant and negative relationship between commuting time and subjective health, and the positive sign in the estimate of commuting time squared suggests that this negative relationship flattens out when commuting time increases.[5] Rejection at the 1% level of the F-statistic shows the joint significance of the commuting time variables. However, and even though the correlation is significant, its size is rather small. In particular, one additional minute of commuting time is related to a lower health level of 0.005 of a standard deviation of health. The sign and magnitude of our findings are in line with those of Hansson *et al.* (2011) using cross-sectional data for Sweden and of Künn-Nelen (2016) using panel data to take into account fixed unobserved effects for the UK.

In contrast, Column (1) of Panel (B) shows that individuals who commute longer times report a statistically significant higher body mass index, but this positive association decreases as commuting time increases.[6] Rejection at the 10% level of the F-statistic suggest a joint but borderline significance of the commuting time variables. As in prior studies (Frank *et al.,* 2004; Lindström, 2008; Künn-Nelen, 2016), our estimates indicate that one extra minute of commuting time is associated with a 0.015 larger body mass index.

Column (2) shows our main results of interest, that is, the estimates of the relationship between health and active commuting. Results in Panel (A) show that individuals who commute more time by walking report statistically significant higher levels of subjective health, at the 1% level as indicated by the F-test of joint significance. In the same line, individuals who commute longer by bicycle also report higher levels of subjective health at

[5] Even though the estimates suggest a U-shaped relationship, note that the turning point is around 93 minutes of commuting time, and because 99% of the sample reports a commuting time below 93 minutes, the negative relationship between commuting and subjective health holds for practically the entire sample.

[6] In this case, the relationship between commuting time and body mass index exhibits an inverse U-shape. However, because the turning point is around 112 minutes of commuting time, for 99.3% of the sample this association is positive.

the 1% level. In the case of cycling, evidence points to a linear relationship with subjective health. In turn, estimates in Panel (B) suggest that individuals who commute longer by walking and cycling report a statistically significant lower body mass index (at the 5% and 1% levels, respectively). For both means of active transportation, these positive associations flatten out as commuting time increases. Compared to the size effect of (overall) commuting time, the magnitude of the active commuting estimates is larger. In particular, one additional minute of commuting time by walking (cycling) is related to a 0.058 (0.28) lower body mass index. We observe that when incorporating active commuting variables, (overall) commuting time remains statistically significant at the 1% level in the case of subjective health, but loses its (already weak) statistical significance in the case of the body mass index.

Overall, we find that individuals who commute for longer times report lower subjective health status, while individuals who engage in longer commutes either by walking or cycling report higher subjective health and lower body mass index.

We perform several robustness checks to assess the sensitivity of our main findings, as described in Section 4. In Table 3, we report the results of an alternative model in which commuting time is treated as an ordinal measure by including a set of indicators for time intervals. The reference category for (overall) commuting time is less than 15 minutes, while the reference for active commuting is less than 5 minutes. Column (1) of Panel (A) shows that all time indicators are negative and statistically significant, meaning that individuals commuting for longer times report lower levels of subjective health, and the magnitude of this negative association increases as commute time increases. As expected, all commuting time dummies are jointly significantly related to subjective health at the 1% level. Column (1) of Panel (B) shows that only some time indicators are significantly and negatively related to the body mass index, but all commuting time dummies are jointly significant at the 5% level. This evidence strengthens our previous findings.

Column (2) of Panel (A) indicates that time intervals are not significantly related to commuting time by walking, either individually or jointly. However, commuting more than 15 minutes by bicycle is related to higher levels of subjective health – in comparison to commuting less than 5 minutes by bicycle. As a consequence, all commuting time intervals are jointly significant at the 5% level in the case of commuting by bicycle. Lastly, commuting time indicators for walking are jointly but weakly (at the 10% level) related to the body mass index, while indicators for cycling are jointly significantly related to the body mass index at the 1% level. These results suggest that our main estimates are robust, with the exception of the relationship between walking to commute and subjective health.

In Table 4, we estimate a model including two indicator variables to capture whether the individual commutes by walking or cycling.[7] Results indicate that (overall) commuting time is significantly related to subjective health, but not significant in the case of the body mass index, as indicated by the F-test. Further, commuting on foot is not significant when analyzing subjective health or the body mass index, while commuting by cycling is positively (negatively) related to subjective health (body mass index) at the 1% level. These results confirm that our main estimates regarding commuting by cycling are robust.

In Table 5, we exclude from the analysis variables capturing potentially compensating factors. Our estimation shows that estimates are very similar in size to those of our main model, suggesting that compensating factors do not substantially (or significantly) alter the relationship between commuting and health measures.

Table 6 reports an ordered logit model to account for the ordinal nature of the subjective health variable. We observe that commuting time estimates are larger than those reported in Table 2 (Column (2) of Panel (A)), but their sign is consistent and their statistical significance holds. This is in line with prior literature on well-being of individuals showing that results are typically robust to accounting for the ordinal character of the dependent variables (Ferrer-i-Carbonell and Frijters, 2004).

Overall, our robustness checks confirm our finding that individuals commuting for longer times report lower subjective health status, while individuals commuting by bicycle report higher subjective health and lower body mass index. In turn, commuting on foot is weakly related to health measures since its statistical significance changes in some of our robustness analyses.

Despite that the results shown so far are robust, the association between active commuting, on the one hand, and better health status and lower BMI, on the other hand, could be biased.

[7] Note that in this case Columns (1) are omitted since results are the same as those reported in Table 2.

It could be that for those workers who are comparatively healthier, the effort to use the bicycle to go to/from work is lower, in comparison to less healthy workers, and thus the probability of using the bicycle is explained by the health status of workers (i.e., reverse causality). Thus, we instrument commuting by bicycle using a variable that accounts for the environmental culture or green attitude of individuals (see Wooldridge (2015) for a description of the Instrumental Variable estimation method). In particular, we rely on the General Social Survey (GSS) from the United States for the years 2014 and 2016 which contains information on the degree of interest of individuals regarding environmental pollution issues. Individuals respond whether they are "very interested" (the variable takes value 1), "moderately interested" (the variable takes value "2") or "not at all interested" (the variable takes the value "3") on environmental pollution issues. A lower value reflects more interest in environmental issues by individuals in a given region. We compute the average response at the regional level for the following major areas: New England, Mid-Atlantic, East North Central, West North Central, South Atlantic, East South Central, West South Central, Mountain, and Pacific.[8] Table A6 shows the average response of the degree of interest of individuals regarding environmental pollution issues across the major regions. On average, individuals are between very interested and moderately interested in environmental pollution issues. In sum, we use this variable to instrument commuting by bicycle on subjective health and BMI, using the Generalized Methods of Moments.

Table 7 shows the results for the second stage of our IV estimations.[9] We find that time commuting by bicycle is positively related to subjective health at the 10% level, while it is negatively related to the body mass index at the 5% level. Our instrumentation exercise reinforces our main results, that individuals who commute for longer by bicycle report higher subjective health and lower body mass index.

[8] By matching our instrumental variable at the level of the region with our sample, which contains information at the level of the state, we lose 29 observations corresponding to the District of Columbia.

[9] Table A7 of the Appendix shows the main coefficient of interest of the first-stage estimation of the IV regression. The variable accounting for the green attitude of individuals is negative and significantly related to time spent commuting by bicycle, as expected. That is, a greater level of concern about environmental issued, captured by a lower value of the instrumental variable, is associated with more time spent commuting by bicycle. At the same time, we consider it safe to assume that the instrument is not related to health measures. Further, the value of the F-test of excluded instruments shows that the green attitude variable is strong.

6. Conclusions

Commuting is part of the daily life of workers worldwide, and in some countries, such as the US, this activity is primarily done with the use of private cars. This is important for both public health, for employees and employers alike, as the literature has shown that commuting by car has negative impacts on health and is related to increased BMI. Alternative modes of transport for commuting, which include active modes such as walking and cycling, have been reported to be related to lower BMI, especially cycling. Analyzing a sample of workers from the ATUS, we examine the relationship between active commuting and health (subjective health and BMI) and find that longer commutes by bicycle are significantly related to higher levels of subjective health and a lower body mass index. The results for walking as a mean of commuting are not conclusive. Thus, our results point to the use of the bicycle for commuting as a way to increase the health of workers.

In a context where being overweight and obese is an important problem in terms of public health and employment, since poor health of workers represents a cost for the government and for companies, public policies and employer interventions aimed at boosting the use of bicycles among their workers are desirable. While interventions on the part of policy makers may involve investments in infrastructures (e.g., bike lanes, bike-sharing schemes), legislation (e.g., preference to cyclists in central areas of cities) or the control of bicycle theft and greater citizen security, interventions on the part of companies may involve incentive schemes for workers, or preferences when choosing work schedules for those who cycle.

Understanding the factors that influence the decision to adopt more environmentally friendly modes of transport for commuting is fundamental to the transition towards a new era of sustainable development (Brundtland Report, 1987). Cycling for commuting may have benefits beyond health, including environmental benefits, and thus developing strategies to promote alternative modes of mobility via physical activity may reduce GHG emissions. Thus, appropriate investments in infrastructure related to cycling are crucial to aid in the "greening" of individual behaviors in travel activities, which would complement strategies to produce behavioral, pro-environmental changes, such as shifting consumption patterns to relatively low-impact alternatives, or decreasing overall consumption (Stern et al., 1997; Shwom and Lorenzen, 2012; Schmitt et al, 2018).

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Table 1. Descriptive Statistics

	Mean	Std. Dev.
Panel (A): health		
general health (1 “poor” to 5 “excellent”)	3.7	0.93
1 if health is "poor" (%)	14.2	11.8
1 if health is "fair" (%)	7.9	27.1
1 if health is "good" (%)	32.5	46.8
1 if health is "very good" (%)	37.7	48.4
1 if health is "excellent" (%)	20.3	40.2
body mass index	27.9	6.0
Panel (B): commuting time		
commuting time (minutes)	24.7	20.3
commuting time cycling (minutes)	11.2	12.7
commuting time walking (minutes)	15.6	11.2
% of individuals walking	6.6	24.8
% of individuals cycling	0.7	8.2
Panel (C): socio-demographic and family characteristics		
age	41.5	12.4
male	0.57	0.50
native	0.81	0.39
primary education	0.07	0.25
secondary education	0.27	0.44
higher education	0.66	0.47
full-time employee	0.87	0.33
presence of a partner	0.57	0.49
household size	3.0	1.5
number of children	0.8	1.1
home owner	0.69	0.46
family income < 20,000 usd	0.08	0.28
family income > 20,000 and < 50,000 usd	0.27	0.44
family income > 50,000 usd	0.65	0.48
number of individuals	7,515	

Note: Sample consists of working individuals aged 21 to 65 years old travelling to/from work, from the ATUS Eating and Health Module 2014-2015-2016. Health variable is scaled from 1 (“poor”) to 5 (“excellent”).

Table 2. Active Commuting and Health

	(A) Subjective Health		(B) BMI	
	(1)	**(2)**	**(1)**	**(2)**
commuting time	-0.005***	-0.005***	0.015**	0.015**
	(0.001)	(0.001)	(0.007)	(0.007)
commuting time squared	0.000***	0.000***	-0.000*	-0.000*
	(0.000)	(0.000)	(0.000)	(0.000)
commuting time walking	-	0.005	-	-0.058***
		(0.005)		(0.022)
commuting time walking squared	-	-0.000***	-	0.000***
		(0.000)		(0.000)
commuting time cycling	-	0.036*	-	-0.280***
		(0.019)		(0.089)
commuting time cycling squared	-	-0.000	-	0.004*
		(0.000)		(0.002)
F-statistic for joint significance:				
commuting time [p-value]	8.62*** [0.0002]	8.19*** [0.0003]	2.48* [0.0842]	2.28 [0.1026]
commuting time walking [p-value]	-	64.50*** [0.0000]	-	3.64** [0.0262]
commuting time cycling [p-value]	-	4.80*** [0.0082]	-	15.55*** [0.0000]
Socio-demographic controls	Yes	Yes	Yes	Yes
Family characteristics controls	Yes	Yes	Yes	Yes
Occupation indicators	Yes	Yes	Yes	Yes
State indicators	Yes	Yes	Yes	Yes
Year and month indicators	Yes	Yes	Yes	Yes
R-squared	0.086	0.088	0.076	0.079
number of individuals	7,515	7,515	7,515	7,515

Note: Sample consists of working individuals aged 21 to 65 years old travelling to/from work, from the ATUS Eating and Health Module 2014-2015-2016. Dependent variable in Panel (A) is the general health status of the individual standardized (z-score rescaled). Dependent variable in Panel (B) is the body mass index. Regressions include demographic and family controls at the individual-level: age (and its square), gender, native status, education level, full-time employee, living in couple, household size, number of children in the household, home ownership, and family income. Full set of estimates is reported in Table A1 of Appendix. Regression includes occupation, state, month, and year indicators. Robust standard errors in parentheses * Significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.

Table 3. Active Commuting and Health: Robustness Check to Specification (Time Intervals)

	(A) Subjective Health		(B) BMI	
	(1)	**(2)**	**(1)**	**(2)**
commuting time 15-30 min. (ref.: < 15)	-0.069**	-0.068**	-0.128	-0.129
	(0.033)	(0.033)	(0.195)	(0.196)
commuting time 30-45 min.	-0.125***	-0.121***	0.545*	0.512*
	(0.043)	(0.043)	(0.284)	(0.285)
commuting time 45-60 min.	-0.154**	-0.152**	0.227	0.192
	(0.064)	(0.064)	(0.324)	(0.325)
commuting time > 60 min.	-0.185**	-0.180**	1.181***	1.118**
	(0.084)	(0.084)	(0.434)	(0.436)
commuting time walking 5-10 min. (ref.: < 5)	-	0.038	-	-0.394
		(0.105)		(0.514)
commuting time walking 10-15 min.	-	0.065	-	-1.623**
		(0.171)		(0.812)
commuting time walking > 15 min.	-	-0.048	-	-0.945*
		(0.170)		(0.518)
commuting time cycling 5-10 min. (ref.: < 5)	-	-0.014	-	-1.362
		(0.380)		(2.708)
commuting time cycling 10-15 min.	-	0.351	-	-4.730***
		(0.308)		(1.088)
commuting time cycling > 15 min.	-	0.780***	-	-3.786***
		(0.266)		(0.949)
F-statistic for joint significance:				
commuting intervals [p-value]	3.71*** [0.0051]	3.51*** [0.0072]	3.24** [0.0115]	2.89** [0.0211]
commuting by walking intervals [p-value]	-	0.12 [0.9467]	-	2.45* [0.0618]
commuting by cycling intervals [p-value]	-	3.29** [0.0199]	-	11.65*** [0.0000]
Socio-demographic controls	Yes	Yes	Yes	Yes
Family characteristics controls	Yes	Yes	Yes	Yes
Occupation indicators	Yes	Yes	Yes	Yes
State indicators	Yes	Yes	Yes	Yes
Year and month indicators	Yes	Yes	Yes	Yes
R-squared	0.086	0.087	0.077	0.081
number of individuals	7,515	7,515	7,515	7,515

Note: Sample consists of working individuals aged 21 to 65 years old travelling to/from work, from the ATUS Eating and Health Module 2014-2015-2016. Dependent variable in Panel (A) is the general health status of the individual standardized (z-score rescaled). Dependent variable in Panel (B) is the body mass index. Regressions include demographic and family controls at the individual-level: age (and its square), gender, native status, education level, full-time employee, living in couple, household size, number of children in the household, home ownership and family income. Full set of estimates is reported in Table A2 of Appendix. Regression includes occupation, state, month and year indicators. Robust standard errors in parentheses * Significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.

Table 4. Active Commuting and Health: Robustness Check to Specification (Indicators)

	(A) Subjective Health	(B) BMI
commuting time	-0.005***	0.014*
	(0.001)	(0.007)
commuting time squared	0.000***	-0.000*
	(0.000)	(0.000)
1 if commutes walking	0.015	-0.410
	(0.060)	(0.320)
1 if commutes cycling	0.442***	-3.177***
	(0.165)	(0.865)
F-statistic for joint significance:		
commuting time [p-value]	8.05*** [0.0002]	1.90 [0.1490]
Socio-demographic controls	Yes	Yes
Family characteristics controls	Yes	Yes
Occupation indicators	Yes	Yes
State indicators	Yes	Yes
Year and month indicators	Yes	Yes
R-squared	0.087	0.078
number of individuals	7,515	7,515

Note: Sample consists of working individuals aged 21 to 65 years old travelling to/from work, from the ATUS Eating and Health Module 2014-2015-2016. Dependent variable in Panel (A) is the general health status of the individual standardized (z-score rescaled). Dependent variable in Panel (B) is the body mass index. Regressions include demographic and family controls at the individual-level: age (and its square), gender, native status, education level, full-time employee, living in couple, household size, number of children in the household, home ownership and family income. Full set of estimates is reported in Table A3 of Appendix. Regression includes occupation, state, month and year indicators. Robust standard errors in parentheses * Significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.

Table 5. Active Commuting and Health: Robustness Check to Excluding Compensating Factors

	(A) Subjective Health		(B) BMI	
	(1)	(2)	(1)	(2)
commuting time	-0.004***	-0.004***	0.014**	0.014*
	(0.001)	(0.001)	(0.007)	(0.007)
commuting time squared	0.000***	0.000***	-0.000*	-0.000*
	(0.000)	(0.000)	(0.000)	(0.000)
commuting time walking	-	0.006	-	-0.067***
		(0.005)		(0.023)
commuting time walking squared	-	-0.000***	-	0.000***
		(0.000)		(0.000)
commuting time cycling	-	0.037*	-	-0.291***
		(0.020)		(0.093)
commuting time cycling squared	-	-0.000	-	0.004*
		(0.000)		(0.002)
F-statistic for joint significance:				
commuting time [p-value]	7.07*** [0.0009]	6.71*** [0.0012]	2.05 [0.1293]	1.86 [0.1564]
commuting time walking [p-value]	-	97.57*** [0.0000]	-	4.48** [0.0114]
commuting time cycling [p-value]	-	4.54** [0.0107]	-	13.08*** [0.0000]
Socio-demographic controls	Yes	Yes	Yes	Yes
Family characteristics controls	Yes	Yes	Yes	Yes
Occupation/Income controls	No	No	No	No
State indicators	Yes	Yes	Yes	Yes
Year and month indicators	Yes	Yes	Yes	Yes
R-squared	0.061	0.064	0.058	0.061
number of individuals	7,515	7,515	7,515	7,515

Note: Sample consists of working individuals aged 21 to 65 years old travelling to/from work, from the ATUS Eating and Health Module 2014-2015-2016. Dependent variable in Panel (A) is the general health status of the individual standardized (z-score rescaled). Dependent variable in Panel (B) is the body mass index. Regressions include demographic and family controls at the individual-level: age (and its square), gender, native status, education level, full-time employee, living in couple, household size, number of children in the household and home ownership. Full set of estimates is reported in Table A4 of Appendix. Regression includes state, month and year indicators. We exclude income, full time-employment and occupation indicators. Robust standard errors in parentheses * Significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.

Table 6. Active Commuting and Health: Robustness Check to Estimation Method (Ordered Logit)

	Subjective Health
commuting time	-0.010***
	(0.002)
commuting time squared	0.000***
	(0.000)
commuting time walking	0.013
	(0.010)
commuting time walking squared	-0.000***
	(0.000)
commuting time cycling	0.096**
	(0.044)
commuting time cycling squared	-0.001
	(0.001)
F-statistic for joint significance:	
commuting time [p-value]	16.46*** [0.0003]
commuting time walking [p-value]	15.21*** [0.0005]
commuting time cycling [p-value]	8.71** [0.0128]
Socio-demographic controls	Yes
Family characteristics controls	Yes
Occupation indicators	Yes
State indicators	Yes
Year and month indicators	Yes
R-squared	0.036
number of individuals	7,515

Note: Sample consists of working individuals aged 21 to 65 years old travelling to/from work, from the ATUS Eating and Health Module 2014-2015-2016. Dependent variable is the general health status of the individual standardized (z-score rescaled). Regression includes demographic and family controls at the individual-level: age (and its square), gender, native status, education level, full-time employee, living in couple, household size, number of children in the household, home ownership and family income. Full set of estimates is reported in Table A5 of Appendix. Regression includes occupation, state, month and year indicators. Robust standard errors in parentheses * Significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.

Table 7. Active Commuting and Health, Instrumental Variable estimations

	(A) Subjective Health	(B) BMI
Instrumented variable: commuting time cycling	**0.345***	**-3.752****
	(0.192)	**(1.504)**
commuting time	-0.001*	0.003
	(0.001)	(0.005)
commuting time walking	-0.001	-0.040*
	(0.005)	(0.022)
Socio-demographic controls	Yes	Yes
Family characteristics controls	Yes	Yes
Occupation/Income controls	No	No
Year and month indicators	Yes	Yes
number of individuals	7,486	7,486

Note: Sample consists of working individuals aged 21 to 65 years old travelling to/from work, from the ATUS Eating and Health Module 2014-2015-2016. Dependent variable in Panel (A) is the general health status of the individual standardized (z-score rescaled). Dependent variable in Panel (B) is the body mass index. Instrumental variable: green attitude from the General Social Survey at the regional level. Instrumented variable: commuting time cycling. Regressions include demographic and family controls at the individual-level: age (and its square), gender, native status, education level, full-time employee, living in couple, household size, number of children in the household and home ownership. Full set of estimates is reported in Table A8 of Appendix. Regression includes month and year indicators. We exclude income, full time-employment and occupation indicators. Robust standard errors in parentheses * Significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.

Appendix

Table A1. Active Commuting and Health, Full Set of Estimates of Table 2

	(A) Subjective Health		(B) BMI	
	(1)	(2)	(1)	(2)
commuting time	-0.005***	-0.005***	0.015**	0.015**
	(0.001)	(0.001)	(0.007)	(0.007)
commuting time squared	0.000***	0.000***	-0.000*	-0.000*
	(0.000)	(0.000)	(0.000)	(0.000)
commuting time walking	-	0.005	-	-0.058***
		(0.005)		(0.022)
commuting time walking squared	-	-0.000***	-	0.000***
		(0.000)		(0.000)
commuting time cycling	-	0.036*	-	-0.280***
		(0.019)		(0.089)
commuting time cycling squared	-	-0.000	-	0.004*
		(0.000)		(0.002)
age	-0.035***	-0.035***	0.378***	0.379***
	(0.011)	(0.011)	(0.064)	(0.064)
age squared	0.000***	0.000***	-0.004***	-0.004***
	(0.000)	(0.000)	(0.001)	(0.001)
male	0.074**	0.072**	0.840***	0.870***
	(0.032)	(0.032)	(0.203)	(0.202)
native	-0.005	-0.009	1.374***	1.390***
	(0.040)	(0.040)	(0.229)	(0.229)
secondary education	0.278***	0.272***	-0.241	-0.231
	(0.075)	(0.075)	(0.417)	(0.417)
higher education	0.382***	0.375***	-0.809*	-0.784*
	(0.075)	(0.074)	(0.419)	(0.420)
full-time employee	0.067	0.064	0.479*	0.471
	(0.051)	(0.051)	(0.290)	(0.290)
presence of a partner	0.091***	0.091***	0.019	0.003
	(0.034)	(0.034)	(0.216)	(0.216)
household size	-0.039**	-0.040**	0.309***	0.316***
	(0.019)	(0.019)	(0.111)	(0.110)
number of children	0.007	0.008	-0.222	-0.233
	(0.024)	(0.024)	(0.143)	(0.142)
home owner	0.020	0.028	-0.206	-0.278
	(0.038)	(0.037)	(0.218)	(0.219)
family income >20.000 and < 50.000	0.101*	0.106*	-0.261	-0.311
	(0.060)	(0.061)	(0.358)	(0.359)
family income > 50.000	0.289***	0.293***	-1.127***	-1.165***
	(0.063)	(0.063)	(0.366)	(0.367)
Occupation indicators	Yes	Yes	Yes	Yes
State indicators	Yes	Yes	Yes	Yes
Year and month indicators	Yes	Yes	Yes	Yes
R-squared	0.086	0.088	0.076	0.079
number of individuals	7,515	7,515	7,515	7,515

Note: Sample consists of working individuals aged 21 to 65 years old travelling to/from work, from the ATUS Eating and Health Module 2014-2015-2016. Dependent variable in Panel (A) is the general health status of the individual standardized (z-score rescaled). Dependent variable in Panel (B) is the body mass index. Robust standard errors in parentheses * Significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.

Table A2. Active Commuting and Health: Robustness Check to Specification (Time Intervals), Full Set of Estimates of Table 3

	(A) Subjective Health		(B) BMI	
	(1)	(2)	(1)	(2)
commuting time 15-30 min. (ref.: < 15)	-0.069**	-0.068**	-0.128	-0.129
	(0.033)	(0.033)	(0.195)	(0.196)
commuting time 30-45 min.	-0.125***	-0.121***	0.545*	0.512*
	(0.043)	(0.043)	(0.284)	(0.285)
commuting time 45-60 min.	-0.154**	-0.152**	0.227	0.192
	(0.064)	(0.064)	(0.324)	(0.325)
commuting time > 60 min.	-0.185**	-0.180**	1.181***	1.118**
	(0.084)	(0.084)	(0.434)	(0.436)
commuting time walking 5-10 min. (ref.: < 5)	-	0.038	-	-0.394
		(0.105)		(0.514)
commuting time walking 10-15 min.	-	0.065	-	-1.623**
		(0.171)		(0.812)
commuting time walking > 15 min.	-	-0.048	-	-0.945*
		(0.170)		(0.518)
commuting time cycling 5-10 min. (ref.: < 5)	-	-0.014	-	-1.362
		(0.380)		(2.708)
commuting time cycling 10-15 min.	-	0.351	-	-4.730***
		(0.308)		(1.088)
commuting time cycling > 15 min.	-	0.780***	-	-3.786***
		(0.266)		(0.949)
age	-0.035***	-0.035***	0.376***	0.378***
	(0.011)	(0.011)	(0.064)	(0.064)
age squared	0.000***	0.000***	-0.004***	-0.004***
	(0.000)	(0.000)	(0.001)	(0.001)
male	0.075**	0.073**	0.838***	0.870***
	(0.032)	(0.032)	(0.202)	(0.202)
native	-0.005	-0.008	1.365***	1.385***
	(0.040)	(0.040)	(0.229)	(0.229)
secondary education	0.277***	0.276***	-0.240	-0.225
	(0.075)	(0.075)	(0.415)	(0.414)
higher education	0.383***	0.380***	-0.800*	-0.778*
	(0.075)	(0.075)	(0.417)	(0.417)
full-time employee	0.067	0.067	0.484*	0.477*
	(0.051)	(0.051)	(0.289)	(0.288)
presence of a partner	0.090***	0.092***	0.033	0.007
	(0.034)	(0.034)	(0.217)	(0.217)
household size	-0.039**	-0.040**	0.310***	0.320***
	(0.019)	(0.019)	(0.110)	(0.110)
number of children	0.008	0.008	-0.229	-0.241*
	(0.024)	(0.024)	(0.142)	(0.142)
home owner	0.022	0.026	-0.204	-0.280
	(0.037)	(0.037)	(0.218)	(0.219)
family income > 20.000 and < 50.000	0.103*	0.101*	-0.254	-0.305
	(0.060)	(0.061)	(0.356)	(0.357)
family income > 50.000	0.288***	0.288***	-1.108***	-1.140***
	(0.063)	(0.064)	(0.364)	(0.364)
Occupation indicators	Yes	Yes	Yes	Yes
State indicators	Yes	Yes	Yes	Yes
Year and month indicators	Yes	Yes	Yes	Yes
R-squared	0.086	0.087	0.077	0.081
number of individuals	7,515	7,515	7,515	7,515

Note: Sample consists of working individuals aged 21 to 65 years old travelling to/from work, from the ATUS Eating and Health Module 2014-2015-2016. Dependent variable in Panel (A) is the general health status of the individual standardized (z-score rescaled). Dependent variable in Panel (B) is the body mass index. Robust standard errors in parentheses * Significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.

Table A3. Active Commuting and Health: Robustness Check to Specification (Indicators), Full Set of Estimates of Table 4

	(A) Subjective Health	(B) BMI
commuting time	-0.005***	0.014*
	(0.001)	(0.007)
commuting time squared	0.000***	-0.000*
	(0.000)	(0.000)
1 if commutes walking	0.015	-0.410
	(0.060)	(0.320)
1 if commutes cycling	0.442***	-3.177***
	(0.165)	(0.865)
age	-0.035***	0.379***
	(0.011)	(0.064)
age squared	0.000***	-0.004***
	(0.000)	(0.001)
male	0.072**	0.864***
	(0.032)	(0.202)
native	-0.007	1.380***
	(0.040)	(0.229)
secondary education	0.278***	-0.247
	(0.075)	(0.417)
higher education	0.381***	-0.800*
	(0.075)	(0.420)
full-time employee	0.068	0.466
	(0.051)	(0.290)
presence of a partner	0.092***	0.008
	(0.034)	(0.217)
household size	-0.040**	0.314***
	(0.019)	(0.110)
number of children	0.008	-0.230
	(0.024)	(0.142)
home owner	0.024	-0.252
	(0.037)	(0.220)
family income > 20.000 and < 50.000	0.102*	-0.279
	(0.060)	(0.358)
family income > 50.000	0.291***	-1.142***
	(0.063)	(0.367)
Occupation indicators	Yes	Yes
State indicators	Yes	Yes
Year and month indicators	Yes	Yes
R-squared	0.087	0.078
number of individuals	7,515	7,515

Note: Sample consists of working individuals aged 21 to 65 years old travelling to/from work, from the ATUS Eating and Health Module 2014-2015-2016. Dependent variable in Panel (A) is the general health status of the individual standardized (z-score rescaled). Dependent variable in Panel (B) is the body mass index. Robust standard errors in parentheses * Significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.

Table A4. Active Commuting and Health: Robustness Check to Excluding Compensating Factors, Full Set of Estimates of Table 5

	(A) Subjective Health		(B) BMI	
	(1)	(2)	(1)	(2)
commuting time	-0.004***	-0.004***	0.014**	0.014*
	(0.001)	(0.001)	(0.007)	(0.007)
commuting time squared	0.000***	0.000***	-0.000*	-0.000*
	(0.000)	(0.000)	(0.000)	(0.000)
commuting time walking	-	0.006	-	-0.067***
		(0.005)		(0.023)
commuting time walking squared	-	-0.000***	-	0.000***
		(0.000)		(0.000)
commuting time cycling	-	0.037*	-	-0.291***
		(0.020)		(0.093)
commuting time cycling squared	-	-0.000	-	0.004*
		(0.000)		(0.002)
age	-0.025**	-0.025**	0.369***	0.369***
	(0.011)	(0.011)	(0.063)	(0.062)
age squared	0.000*	0.000*	-0.004***	-0.004***
	(0.000)	(0.000)	(0.001)	(0.001)
male	0.063**	0.060**	0.817***	0.847***
	(0.029)	(0.029)	(0.179)	(0.178)
native	0.029	0.026	1.318***	1.334***
	(0.040)	(0.040)	(0.227)	(0.227)
secondary education	0.335***	0.330***	-0.242	-0.234
	(0.071)	(0.071)	(0.398)	(0.398)
higher education	0.558***	0.550***	-1.133***	-1.102***
	(0.067)	(0.067)	(0.373)	(0.374)
presence of a partner	0.154***	0.154***	-0.189	-0.210
	(0.034)	(0.034)	(0.213)	(0.212)
household size	-0.037*	-0.038**	0.290***	0.297***
	(0.019)	(0.019)	(0.112)	(0.110)
number of children	-0.008	-0.007	-0.151	-0.165
	(0.024)	(0.024)	(0.144)	(0.143)
home owner	0.088**	0.097***	-0.517**	-0.600***
	(0.037)	(0.037)	(0.216)	(0.216)
Occupation/Income indicators	No	No	No	No
State indicators	Yes	Yes	Yes	Yes
Year and month indicators	Yes	Yes	Yes	Yes
R-squared	0.061	0.064	0.058	0.061
number of individuals	7,515	7,515	7,515	7,515

Note: Sample consists of working individuals aged 21 to 65 years old travelling to/from work, from the ATUS Eating and Health Module 2014-2015-2016. Dependent variable in Panel (A) is the general health status of the individual standardized (z-score rescaled). Dependent variable in Panel (B) is the body mass index. Robust standard errors in parentheses * Significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.

Table A5. Active Commuting and Health: Robustness Check to Estimation Method (Ordered Logit), Full Set of Estimates of Table 6

	Subjective Health
commuting time	-0.010***
	(0.002)
commuting time squared	0.000***
	(0.000)
commuting time walking	0.013
	(0.010)
commuting time walking squared	-0.000***
	(0.000)
commuting time cycling	0.096**
	(0.044)
commuting time cycling squared	-0.001
	(0.001)
age	-0.073***
	(0.021)
age squared	0.001***
	(0.000)
male	0.113*
	(0.062)
native	-0.026
	(0.077)
secondary education	0.539***
	(0.145)
higher education	0.733***
	(0.144)
full-time employee	0.120
	(0.097)
presence of a partner	0.174***
	(0.067)
household size	-0.079**
	(0.038)
number of children	0.012
	(0.048)
home owner	0.056
	(0.073)
family income > 20.000 and < 50.000	0.190
	(0.117)
family income > 50.000	0.563***
	(0.123)
Occupation indicators	Yes
State indicators	Yes
Year and month indicators	Yes
R-squared	0.036
number of individuals	7,515

Note: Sample consists of working individuals aged 21 to 65 years old travelling to/from work, from the ATUS Eating and Health Module 2014-2015-2016. Dependent variable is the general health status of the individual standardized (z-score rescaled). Robust standard errors in parentheses * Significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.

Table A6. Average degree of interest regarding environmental pollution issues across major regions

Major regions	Mean	Std. Dev.
New England	1.53	0.57
Mid-Atlantic	1.64	0.63
East North Central	1.70	0.63
West North Central	1.78	0.65
South Atlantic	1.72	0.65
East South Central	1.77	0.65
West South Central	1.71	0.70
Mountain	1.73	0.69
Pacific	1.60	0.66

Note: Information available in the General Social Survey (GSS) from the United States for the years 2014 and 2016. The variable takes the value of 1 if individuals responded "very interested, the value of "2" if individuals responded "moderately interested, and the value of "3" if "not at all interested.

Table A7. Active Commuting and Health: IV First Stage Estimation

	commuting time cycling
green attitude	-1.346***
	(0.421)
F test of excluded instruments [p-value]:	10.19 [0.0014]
Occupation indicators	Yes
Year and month indicators	Yes
R-squared	0.087
number of individuals	7,486

Note: Sample consists of working individuals aged 21 to 65 years old travelling to/from work, from the ATUS Eating and Health Module 2014-2015-2016. Dependent variable: commuting time cycling. Instrumental variable: green attitude from the General Social Survey at the regional level. Robust standard errors in parentheses. * Significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.

Table A8. Active Commuting and Health: Full Set of Estimates of Table 7

	(A) Subjective Health	(B) BMI
Instrumented variable: commuting time cycling	0.345*	-3.752**
	(0.192)	(1.504)
commuting time	-0.001*	0.003
	(0.001)	(0.005)
commuting time walking	-0.001	-0.040*
	(0.005)	(0.022)
age	-0.039***	0.412***
	(0.011)	(0.076)
age squared	0.000***	-0.004***
	(0.000)	(0.001)
male	0.042	1.206***
	(0.041)	(0.312)
native	-0.045	1.829***
	(0.045)	(0.312)
secondary education	0.297***	-0.532
	(0.084)	(0.568)
higher education	0.383***	-0.854
	(0.083)	(0.569)
full-time employee	0.075	0.432
	(0.053)	(0.323)
presence of a partner	0.100***	-0.125
	(0.038)	(0.294)
household size	-0.051**	0.444**
	(0.024)	(0.185)
number of children	0.018	-0.323
	(0.029)	(0.209)
home owner	0.081	-0.911**
	(0.054)	(0.369)
family income > 20.000 and < 50.000	0.089	-0.188
	(0.067)	(0.437)
family income > 50.000	0.293***	-1.227***
	(0.069)	(0.419)
Occupation indicators	Yes	Yes
Year and month indicators	Yes	Yes
R-squared	0.087	0.078
number of individuals	7,515	7,515

Note: Sample consists of working individuals aged 21 to 65 years old travelling to/from work, from the ATUS Eating and Health Module 2014-2015-2016. Dependent variable in Panel (A) is the general health status of the individual standardized (z-score rescaled). Dependent variable in Panel (B) is the body mass index. Instrumental variable: green attitude from the General Social Survey at the regional level. Instrumented variable: commuting time cycling. Robust standard errors in parentheses. * Significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.