Daily feelings of US workers and commuting time[*]

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Abstract

Introduction: Millions of individuals commute every day in the US. Despite commuting has been shown to have negative consequences for workers, no evidence has been about how commuting is related to feelings in other episodes. We analyzed the relationship between the feelings reported by American workers throughout the day and the time devoted to commuting. Methods: We used the Well-Being Module of the American Time Use Survey for the years 2010, 2012, and 2013, and analized the relationship between commuting duration and the feelings reported (e.g,. happiness, sadness, stress, fatigue and pain) in both commuting and non-commuting episodes. Results: We found that more time spent on the daily commute was related to higher levels of fatigue and stress during commuting, while also being associated with higher levels of sadness and fatigue during activities of child care. In particular, we found that a 1% increase in the time devoted to commuting during the episode was related to increases of 12 percent and 13 percent of a standard deviation for stress and fatigue, while a 1% increase in the time devoted to commuting during the day was related to increases of 5 percent and 7 percent of one standard deviation in the levels of sadness and stress during child care activities. Conclusions: Our results indicated that longer commutes may be related to higher levels of stress and fatigue of workers, which may in turn affect the quality of the time parents devote to caring for their children.

Keywords: Commuting, American Time Use Survey, Stress, Fatigue.

1. Introduction

In this paper, we analyzed the relationship between commuting time and the utility obtained throughout the day by workers in the US. Many millions of individuals commute every day in the US (with, on average, 25.4 minutes per day commuting, wync.org), and there have been significant increases in commuting time in recent decades (Gimenez-Nadal and Molina, 2014, 2016) Furthermore, commuting has been shown to have negative consequences for workers. There are psychological costs associated with travelling to and from the workplace (Koslowsky, Kluger and Reich, 1995; Evans, Wener and Phillips, 2002; Martin, Goryakin and Suhrcke; 2014; McLeod et al., 2018), while commuting and health outcomes are negatively related (Walsleben et al., 1999; Jansen et al., 2003; Hämming, Gutzwiller and Bauer, 2009; Hansson et al., 2011; Roberts, Hodgson and Dolan, 2011; Hoenner et al, 2012; Kunn-Nelen; 2016; Tajalli and Hajbabaie, 2017). Longer commutes are associated with lower rates of well-being (Stutzer and Frey, 2008; Dolan, Peasgood and White, 2008; Fordham, van Lierop and El-Geneidy, 2018; Friman, Ettema and Olsson, 2018; Lanceé, Burger and Veenhoven; 2018), and are significant sources of worker stress (Novaco, Stokols and Milanesi, 1990; Schaeffer et al., 1988; Hennesy and Wiesenthal, 1999; Wener et al., 2003; Gottholmseder et al., 2009; Rissell et al., 2014). Thus, the analysis of commuting and its relationship to physical/psychological health outcomes and well-being is an important policy issue (Deenihan and Caulfield, 2014; Cavoli et al, 2015; Smith, 2017).

One recent strand of research has focused on the link between travelling/commuting and the feelings/mood reported during this activity (Morris and Guerra, 2015a,2015b; Friman et al., 2017). For instance, Kahneman et al. (2004) and Kahneman and Krueger (2006) show that time spent in commuting ranks among the lowest activities in terms of the "instant enjoyment" obtained by individuals. Stone and Schneider (2016) show that commuting episodes are rated high in stress and tiredness and much lower in meaningfulness, compared with other daily activities, and thus commuting can be considered a low-wellbeing experience. This evidence points to a negative relationship between commuting duration and the feelings experienced during the activity.

But while the analysis of the relationship between feelings and the duration of commuting episodes has been previously analyzed (Stone and Schneider, 2016), no prior research has analyzed how commuting duration is related to feelings in other episodes (e.g., market work, child care). Given the physical constraints commuting imposes on

workers (Gimenez-Nadal and Molina, 2014), other activities engaged in during the day may be affected by commuting, which may be important for policy makers. For instance, if longer commutes are associated with more stress or fatigue during market work activities, this may affect the productivity of workers. Furthermore, if longer commutes are associated with higher stress or fatigue during child care activities, this may affect the quality of child care time, which may have severe conseqences for workers' children, given the existing link between parents' childcare time and childrens' outcomes (Leibowitz, 1974;1977; Haveman and Wolfe, 1995; Todd and Wolpin, 2003;2007; Bernal and Keane, 2011; del Bono et al., 2016). We aim to examine the relationship between the duration of commuting and the feelings reported by workers during their commuting and non-commuting episodes, using data from the *Well-being Module* of the 2010, 2012, and 2013 American Time Use Survey (ATUS).

The rest of the paper is organized as follows. Section 2 describes the data and the empirical evidence, and Section 3 describes our methodsSection 4 describes the main results, and Section 5 sets out our main conclusions.

2. Data and Variables

We used the *Well-being Module* from the 2010, 2012, and 2013 American Time Use Survey (ATUS) to establish a link between individual feelings and the commuting behavior of US workers. In this Survey, respondents are asked to fill out a diary, and thus the ATUS provides us with information on individual time use. The ATUS includes a set of 'primary' activities, including commuting. The database also includes certain personal, family, demographic, and labor variables. The module pertaining to feelings was added to the ATUS diary to capture how individuals felt during selected activities, and was fielded from January through December each year. Respondents were first asked to fill out a diary summarizing episodes of the preceding day.

In the *Well-Being Module* of the ATUS, three episodes from the preceding day, lasting at least five minutes, are randomly selected and diarists are asked to rank on a 7-point scale the extent to which they were happy, stressed, sad, tired, or felt pain during the activity, with "0" indicating "did not experience the feeling at all" and "6" indicating "feeling was extremely strong". Thus, for three episodes for each worker in the sample we had information on the extent to which they felt happy, stressed, sad, tired, or in pain.

2

This allowed us to analyze the relationship between the duration of commuting and the feelings reported by workers in their daily activities.[2]

For the sake of comparison with prior studies (Aguiar and Hurst, 2007; Gimenez-Nadal and Sevilla, 2012), and to minimize the role of time-allocation decisions, such as education and retirement, that have a strong inter-temporal component over the life cycle, we restricted the sample used throughout our analysis to workers between the ages of 21 and 65 (inclusive). We also excluded from the analysis self-employed workers, as they may include commuting as part of their production function, which leads self-employed workers to behave differently in comparison to employees (Gimenez-Nadal, Molina and Velilla, 2018). Furthermore, given that workers may have reported their activities during non-working days, and thus they do not have commuting time, we restricted the analysis to working days, defined as those days where individuals devoted at least 60 minutes to market work activities, excluding commuting. Regarding the definition of commuting time, commuting was defined as an episode with activity code "180501 commuting to/from work".[3] In order to analyze whether commuting was related to lower "experienced utility", we analyzed the feelings of workers according to whether they devoted time to commuting during their working days, or not. In doing so, we again restricted the analysis to those workers who devoted 60 or more minutes of market work activities during the day, and classified them according to whether time was spent commuting or not during this day. We had 2,637 episodes from 885 workers who did not devote time to commuting during their working days, and 17,290 episodes from 5,805 workers who did devote time to commuting during their working days. Several socio-demographic and labor characteristics were also considered in the analysis: hourly wage (and its square), market work hours in the day (and its square), age of respondent, whether the respondent had secondary and university education, living in couple, the number of children under 18 in the household, household size, and gender. We additionally controlled for the type of industry and occupation of the worker, following the ATUS coding system. The ATUS recodes industries into 12 categories: 1) Agriculture, forestry, fishing, and hunting, 2) Mining, 3) Construction, 4) Manufacturing, 5) Wholesale and

2 The methodology developed in the ATUS Well-Being module is based on the Day Reconstruction Method (DRM) created by Kahneman et al. (2004). See Kroll and Pokkuta (2013) for a review of the method.

3 Robust results were obtained when we used an alternative definition of commuting, where the activity codes "180599 travel related to work nec" and "180503 travel related to income gen activity" were also classified as commuting. Results are available upon request.

retail trade, 6) Transportation and utilities, 7) Information, 8) Financial activities, 9) Professional and business services, 10) Educational and health services, 11) Leisure and hospitality, and 12) Other services. The ATUS recodes occupation codes into 10 categories: 1) Management, business, and financial occupations, 2) Professional and related occupations, 3) Service occupations, 4) Sales and related occupations, 5) Office and administrative support occupations, 6) Farming, fishing, and forestry occupations, 7) Construction and extraction occupations, 8) Installation, maintenance, and repair occupations, 9) Production occupations, and 10) Transportation and material moving occupations.

3. Methods

Two dimensions were analyzed. The first referred to the commuting episodes and their duration, and how they related to the individual feelings reported during these episodes. Gershuny (2013) showed that there are decreasing marginal utilies in time use activities, which may indicate that feelings during those activities depend on the duration of the activity. Thus, our first analysis focused on commuting episodes, and the relationship between the duration of the episodes and the feelings reported. The large number of episodes (n=2,670) provided us with a solid framework for the analysis, and we estimated the following equation: [4]

$$E_{ij} = \alpha + \beta \log(Episode\_Duration_{ij}) + \gamma X_i + \partial FE_i + \varepsilon_{ij} \qquad (1)$$

where E_{ij} represented the feelings of individual "i" in commuting episode "j", $Episode\_Duration_{ij}$ represented the time spent in commuting episode "j" by worker "i", X_i represented a vector of socio-demographic characteristics (Gimenez-Nadal and Molina, 2016), and ε_{ij} represented the error terms. The set of demographic characteristics includedthose described in the previous Section.[5] FE_i controlled for the state of residence, and the industry and occupation of respondent "i". Standard errors were robust regarding homoskedasticity in all our estimated models, and the error term was clustered at the

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[4] In our regressions, we assumed that our measures of happiness and other feelings were cardinal, an interpretation that is common in the literature on well-being (Ferrer-i-Carbonell and Frijters, 2004). Results using alternative models, such as ordered logit models, were consistent and are available upon request.

[5] In next Section we explore differences in socio-demographic characteristics by using a t-test. The null hypothesis is set as that the sample means are equal

individual level to take into account that different individuals may have a different subjective scale, and thus may report higher or lower values for all the episodes. Observations were weighted using the original survey weights.

We included the number of market work hours during the day because the analysis was restricted to workers on their working days, and thus the feelings reported by them in commuting episodes (e.g., fatigue, or stress) could be affected by the amount of time they devoted to market work activities. Furthermore, prior evidence had found a relationship between daily commuting and daily market work (Schwanen and Dijst, 2002; Gutiérrez-i-Puigarnau and van Ommeren, 2010; Gimenez-Nadal and Molina, 2014), and not considering the time devoted to market work would lead to an ommitted variable bias (Wooldridge, 2009).

The second dimension of the analysis referred to the extent to which the feelings reported by workers during their non-commuting episodes were affected by the duration of their commuting. The notion was that, apart from the negative consequences of commuting length on the feelings reported during the episodes, the time devoted to commuting during the day could be affecting other daily activities. Given that we knew all the activities of the diarists during the day, we could compute the total time devoted to commuting, and link this total time to the feelings reported during other, non-commuting activities, including personal care (eating/personal care, own medical care, travel for personal care), market-work (main work, job search, other work/edu.related activities), non-market work (adult care, cooking/preparing meals, housework, home/car maintenance, other housework, purchasing goods, travel for housework), child care (basic childcare, educ/supervisory childcare, travel for childcare), and leisure (gardening/pet care, voluntary activities, travel for leisure, TV watching, out-of-home leisure, sports/exercise, at-home leisure, reading/listening, writing/paperwork).[6]

We focused on non-commuting episodes, and analyzed the relationship between the total daily commuting time and the feelings reported by workers in their non-commuting episodes. We estimated the following equation:

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[6] See Table A1 in the Appendix for a description of the activity codes included in each category. This classification was based on previous classifications used by Aguiar and Hurst (2007) and Gimenez-Nadal and Sevilla (2012). We had no reason to think that any specific activity could be more affected by commuting than others, and thus we chose broad time-use categories to avoid biased estimates arising from small sample sizes in certain time-use activities (e.g,. watching TV, shopping, gardening). These time-use categories (including commuting time) accounted for 99% of the total time of the day.

$$E_{ir} = \alpha + \beta \log(Daily\_Commuting\_Time_i) + \gamma X_i + \partial FE_i + \varepsilon_{ir} \qquad (2)$$

where E_{ir} represented the feelings of individual "i" in non-commuting episode "r", $Daily\_Commuting\_Time_i$ represented the total daily commuting time for worker "i" during the day, X_i was a vector of socio-demographic characteristics, and ε_{ir} represented the error terms. The set of demographic characteristics was the same as in Equation (1). FE_i controlled for the state of residence, and the industry and occupation of respondent "i". We also forced our standard errors to be robust regarding homoskedasticity in all our estimated models, and the error term was clustered at the individual level. Observations were weighted using the original survey weights, and the analysis was done by activity type (e.g., personal care, market work, non-market work, child-care, leisure)

4. Results

Figure 1 showed the relationship between the time spent in commuting (minutess during the day) and the reported feeling during the same commuting episode. The figures plotted the average score given to all five feelings (happiness, stress, sadness, fatigue, and pain) for each time devoted to commuting; that is, for all workers with the same amount of time devoted to commuting, we averaged the score given to the five feelings. We then (scatter) plotted the mean average score of the five feelings on the time devoted to commuting (x-axis). We also added a linear fit to determine the extent to which scatters were distributed following a linear relationship.[7] The duration of commuting episodes was positively related to feelings of stress and fatigue, while the relationship was not statistically significant at standard levels (e.g., 95 percent confidence level) in the cases of happiness, sadness, and pain. The slopes of the linear fits for both stress and fatigue were 0.42 and 0.34, respectively, with the slopes being statistically significant at the 95% confidence level. The remaining slopes were not statistically significant. Hence, longer commuting episodes are related to higher levels of stress and fatigue during commuting episodes.

Table 1 shows the mean and standard deviation of the time devoted to commuting for those who report positive commuting in our sample.. We observe that, in comparison with

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7 For both the scatter plot and the linear fit, we must take into account that the number of commuting episodes of 30 minutes is different from the number of commuting episodes of 2 hours, for instance. Thus, we need to weight each observation (average feeling score/average commuting duration) by the number of diaries included in the calculation of the average commuting time. We include proportional weights in both the scatter plot and the linear fit, where the weights are built as the ratio of the number of diaries out of the total number of diaries. This is why dots have different sizes, as the size of the dot is proportional to the proportion of diaries included in it.

non-commuters, workers who did any commuting during their working day reported being happier (0.084), although they reported higher levels of stress (0.128) and fatigue (0.253), with such differences being statistically significant at the 99 percent level. Thus, from the analysis of the daily activities, we could conclude that, in comparison with non-commuters, commuters reported higher levels of happiness, but also higher levels of fatigue and stress. These results were consistent with the existing literature that puts commuting as a major cause of stress.

For the time devoted to the different time-use categories, Table 1 shows that those who reported positive commuting time during their working days spent 43.5 minutes on this activity. Comparing commuters and non-commuters in the rest of the uses of time, we found that commuters devoted more time to market work activities (e.g., 93 more minutes), while they devoted less time to non-market work (e.g., 45 fewer minutes), child-care (e.g., 7 fewer minutes) and leisure activities (e.g., 81 fewer minutes) during their working days. Thus, while commuters devoted more time to market work activities, they devoted less time to the rest of the activities in comparison to non-commuters. These results were consistent with the positive relationship between commuting and market work time reported in prior research (Schwanen and Dijst, 2002; Gutiérrez-i-Puigarnau and van Ommeren, 2010; Gimenez-Nadal and Molina, 2014), and with the Household Responsibilities Hypothesis, which argues that household responsibilities limit and reduce the commuting of workers, especially child-care responsibilties (Gimenez-Nadal and Molina, 2016).

Regarding the control variables, we observed that, in comparison with non-commuters, commuters had comparatively lower wages ($5.078 per hour of difference), were 2.72 years younger, and a lower proportion of commuters had university education, lived in couple, and lived in larger households. Also, there were statistically-significant differences in the proportion of commuters and non-commuters working in specific industries and occupations. For instance, comparing industries, we found a higher proportion of commuters in construction, and the leisure and hospitality industries, while, comparing occupations, we found a higher proportion of commuters in service, office and administrative support, construction and extraction, and installation, maintenance and repair occupations.

Table 2 shows the results of estimating Equation (1) for the five feelings, when we considered commuting episodes only, and where the relevant variable was the duration

of these episodes. We observed a positive and statistically significant relationship between the duration of commuting episodes and the feelings of stress and fatigue reported by the worker, as the coefficients were positive and statistically significant at the 99 percent significance level. The explanatory variable (i.e., duration of commuting episodes) was in its log form, and thus we interpreted these results as follows: a 1% increase in the time devoted to commuting during the episode was related to increases of 0.234 and 0.243 units in stress and fatigue, respectively, representing increases of 12 percent and 13 percent of a standard deviation for each feeling, respectively. These results indicated that a longer commute is associated with higher stress and fatigue, which was consistent with prior studies showing that there were psychological costs associated with travel to work, as it increased stress and fatigue, that longer commutes were systematically associated with lower rates of well-being, and that long commutes to work led to stress for workers.

Table 3 shows the results of estimating Equation (2), where the total time devoted to commuting during the day was analyzed in relation to the feelings reported by individuals during non-commuting episodes. The total time in commuting was transformed to its log form (adding unity to allow for non-zero commuting cases), and we focused on five major activities: self-care, market work, non-market work, child-care, and leisure.[8] We observed that more time in daily commuting is related to more sadness and stress during child-care activities, as the regression coefficients are positive and statistically significant at the 95 percent significance level.[9] A 1% increase in the time devoted to commuting during the day was related to increases of 0.062 and 0.126 units in sadness and stress during child care activities, respectively, representing increases of 5 percent and 7 percent of one standard deviation in the levels of these feelings during these activities. In summary, we found that more commuting time during the day had a positive relationship with the levels of negative feelings reported during child care activities.

5. Discussion

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8 We only show the coefficients for the total daily commuting time; the results for the rest of the covariates are found in Tables A2 to A6 in the Appendix.

[9] As a robustness check, we estimated alternative models, where all the observations were pooled in the same OLS regression, and we controlled for the type of activity (e.g., self-care, market work, non-market work, child care, or leisure). We observed that the coefficients for both sadness and fatigue were statistically significant at the 99 percent significance level. To the extent that the reference category in these regressions was child care, these alternative results showed that our results are robust to small sample sizes. Results are available upon request.

Millions of individuals commute to and from work every day, and the analysis of commuting and its relationship to physical/psychological outcomes is important in terms of policy. We analyzed commuting time to better understand the behavior of individuals during these activities, and we examined the relationship between commuting time and the feelings reported by workers, in the US, during their working days. Using data from the *Well-being Module* of the 2010, 2012, and 2013 American Time Use Survey (ATUS), we found that more time spent in commuting is related to higher levels of fatigue and stress during commuting episodes, and that more commuting time during the day had a positive relationship with the levels of negative feelings reported during child care activities. Our analysis contributes to the study of the effects of commuting on individual well-being, by complementing prior studies that use retrospective questions about overall happiness, well-being, or life satisfaction. Our approach focuses on well-being in daily life, as opposed to traditional Subjective Well-Being measures.

Several conclusions can be drawn from these results. First, we found that longer episodes of commuting are related to higher levels of stress and fatigue during these episodes, which may affect the health of workers. Prior results have analyzed how commuting time is related to sickness absence (Hassink and Fernandez, 2017; Gimenez-Nadal, Molina and Velilla, 2018), showing a positive relationship between longer commutes and higher sickness absence rates. Commuting imposes physical limitations on workers (Schwanen and Dijst, 2002; Gimenez-Nadal and Molina, 2014), and longer commutes may impose physical constraints on workers that may contribute to worsen their health. These results are consistent with the prior evidence showing the detrimental effects of commuting on the health and stress levels of workers, and also with research showing that the effective costs of commuting are not rational tradeoffs that are fully considered by commuters or employers, but reflect an error in decision making. In this sense, Stutzer and Frey (2008) and Comerford (2011) have shown a bias in decision making around commuting

Second, more time spent in commuting is positively related to higher levels of sadness and fatigue during child care activities, pointing to longer commutes being associated with a lower quality of child care activities of working parents. This effect of commuting on child care activities may have detrimental effects on children's human capital and future labor outcomes, as parents play a crucial role in the education and habits children acquire (Cardoso, Fontainha and Monfardini, 2010; Doepke and Zilibotti, 2018;

9

Gimenez-Nadal, Molina and Zhu, 2018), including health behaviors. Since health can be considered a durable stock capital of individuals, and thus a component of the stock of individual human capital (Grossman, 1972a;1972b), the acquisition of good health habits (e.g., healthy diet, regular exercise) by children would probably increase the amount of time available to produce monetary earnings in the future. Also, differences in the health habits of children may lead to inequalities in health of these children, which is important not only for creating differences in earnings, but also for the intrinsic value of health, Given the importance of commuting for the health of workers and their children, public policies aimed at improving infrastructure and transport networks may prove important for both policy makers and employers. Such improvements may also be helpful in reducing sickness absence rates and health expenditures, due to the stress of workers, in both the short and long run.

Despite that we cannot talk directly about causality of the effect between commuting and feelings, the evidence presented here appears to be reasonably strong that longer commutes have significant detrimental effects on workers. Our data is a cross-section of individuals, and thus there may be unobservable factors related to both commuting behaviour and the feelings reported during the different activities. In principle, if the feelings and longer commutes are associated with the same unobservables, we should observe that individuals report negative feelings and are also willing to accept longer commutes. This would be consistent with the results obtained regarding the duration of commuting episodes and the feelings reported during those episodes. However, if that were driving the results, we would expect to see commuting showing up significantly in negative feelings during other times as well. In that context, our results act as a counter-factual, in that whatever is happening during commutes in terms of feelings, it is not happening during certain other parts of the day (e.g., market work, non-market work, leisure). Furthermore, the unobservables may be linked to how the individual responds only during the commute. However, if the individual is especially sensitive to commuting, and so reports negative feelings during commuting, we would expect the individual to avoid long commutes, creating a negative correlation between commuting and negative feelings, which is the opposite of what we found.

Furthermore, individuals generally engage in self-care before leaving for work, that is, before differences in commuting can have their effect. We found no robust evidence that self-care is affected by longer commutes. However, most child care activities are done

10

when away from work (e.g., pick up children from school, help with homework, play with children), after differences in commuting time have had their effect. The fact that we found higher levels of fatigue and sadness (associated with longer commutes) during child-care activities, but not during self-care, points to a causal relationship between commuting time and the effect experienced by workers.

One limitation of our analysis is associated with the duration of the commute. Given that the information used in this paper refers to commuting on the same day, then the length of the commute is driven by the average experience of the commutes, plus any single day variation. If we had information on the average experience of the commutes, we could include both that and the commuting deviation for the day on which the feelings are being reported, and we would know whether our results are capturing the effects of an overall long commute, or the effects of having an unexpectedly bad (or good) commute on that specific day. We leave this issue for further research.

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Figure 1. Overall experienced utility, by duration of commuting episodes
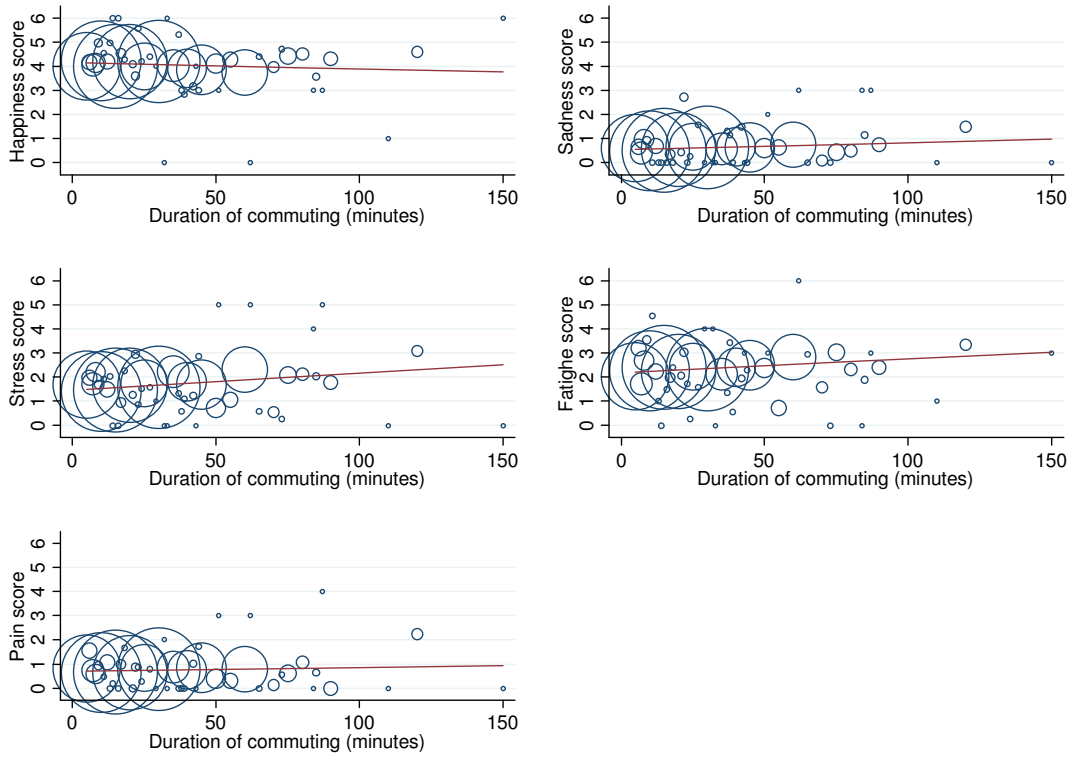
Note: Sample consists of workers between 21 and 65 years old who devoted at least 60 minutes to market work on the diary day. Observations from the *Well-Being Modules* of the American Time Use Survey 2010, 2012 and 2013. Overall values are computed using the Well-being module, adjusted for pooled activity weights. "Duration of commuting" measures the duration of the commuting episode in minutes.

Table 1
Summary Statistics

	Non-Commuters		Commuters		Diff non-commuters /commuters	p-value diff
	Mean	Standard Deviations	Mean	Standard Deviations		
Feelings during episodes (scaled 0-6)	**Mean**	**Sd**	**Mean**	**SD**		
Happiness	4.1	1.6	4.2	1.6	-0.1	0.0
Sadness	0.6	1.2	0.6	1.3	0.0	0.2
Stress	1.7	1.8	1.9	1.9	-0.1	<0.01
Fatigue	2.3	1.9	2.6	1.9	-0.3	<0.01
Pain	0.8	1.5	0.8	1.5	0.0	0.9
Number of espisodes		2,637		17,290		
Time devoted to activities during the day (minutes)						
Commuting	-	-	43.5	(30.8)	-	-
Personal care	523.9	(114.8)	522.5	(102.4)	1.4	0.7
Market work	411.0	(199.2)	503.9	(133.3)	-92.9	<0.01
Non-Market work	117.1	(112.8)	72.4	(82.1)	44.7	<0.01
Child care	32.2	(75.2)	25.1	(57.1)	7.1	<0.01
Leisure	346.3	(166.0)	265.5	(128.8)	80.8	<0.01
Number of workers		885		5,805		
Demographic characteristics						
Hourly wage	25.7	(19.3)	20.7	(13.8)	5.1	<0.01
Age	43.2	(11.8)	40.5	(12.5)	2.7	<0.01
Male	57%	(0.5)	55%	(0.5)	2%	0.3
Secondary education	24%	(0.4)	32%	(0.5)	-8%	<0.01
University education	72%	(0.5)	60%	(0.5)	12%	<0.01
Living in couple	66%	(0.5)	62%	(0.5)	3%	0.1
At least one child<18	75%	(1.0)	81%	(1.1)	-6%	0.1
Household size	3.0	(1.4)	3.1	(1.5)	-0.1	0.0
Agriculture, forestry, fishing, and hunting	3%	(0.2)	1%	(0.1)	2%	<0.01
Mining	1%	(0.1)	1%	(0.1)	0%	1.0
Construction	2%	(0.2)	6%	(0.2)	-3%	<0.01
Manufacturing	19%	(0.4)	15%	(0.4)	4%	<0.01
Wholesale and retail trade	11%	(0.3)	16%	(0.4)	-5%	<0.01
Transportation and utilities	5%	(0.2)	5%	(0.2)	1%	0.4
Information	3%	(0.2)	3%	(0.2)	1%	0.3
Financial activities	9%	(0.3)	9%	(0.3)	0%	0.9
Professional and business services	17%	(0.4)	12%	(0.3)	5%	<0.01
Educational and health services	17%	(0.4)	19%	(0.4)	-2%	0.2
Leisure and hospitality	6%	(0.2)	8%	(0.3)	-2%	0.0
Other services	6%	(0.2)	5%	(0.2)	0%	0.8
Management, business, and financial occup.	23%	(0.4)	17%	(0.4)	6%	<0.01
Professional and related occup.	24%	(0.4)	20%	(0.4)	4%	<0.01
Service occup.	10%	(0.3)	15%	(0.4)	-4%	<0.01
Sales and related occup.	9%	(0.3)	11%	(0.3)	-2%	0.1
Office and administrative support occup.	9%	(0.3)	14%	(0.3)	-5%	<0.01
Farming, fishing, and forestry occup.	3%	(0.2)	1%	(0.1)	2%	<0.01
Construction and extraction occup.	3%	(0.2)	4%	(0.2)	-2%	0.0
Installation, maintenance, and repair occup.	3%	(0.2)	5%	(0.2)	-1%	0.1
Production occup.	10%	(0.3)	8%	(0.3)	2%	0.0
Transportation and material moving occup.	6%	(0.2)	6%	(0.2)	0%	0.6

Number of workers	885	5,805

Notes: Sample consists of employees aged 21 to 65 from the *Well-Being Modules* of the American Time Use Survey 2010, 2012 and 2013. *Commuting* is the time devoted to "travel to or from work". Time use activities are measured in minutes per day. The analysis is restricted to working days, defined as those with more than 60 minutes of market work, excluding commuting. Columns (1) and (2) of Table 1 present mean and standard deviations of the five feelings for non-commuters, Columns (3) and (4) present mean and standard deviations of the five feelings for commuters, Column (5) shows the difference in the average score between non-commuters and commuters (diff=non-commuters – commuters), and Column (6) shows whether the difference is statistically significant.

Table 2
Feelings during commuting episodes, depending on its duration

	Happiness		Sadness		Stress		Fatigue		Pain	
	β	Robust SE	β	Robust SE	β	Robust SE	β	Robust SE	β	Robust SE
Duration of commuting episode	-0.126*	0.069	0.075	0.050	0.234***	0.081	0.243***	0.081	0.022	0.053
Hourly wage	-0.008	0.011	-0.016*	0.009	0.005	0.014	0.015	0.014	-0.022**	0.010
Hourly wage squared	(0.001)	0.013	0.022*	0.012	(0.001)	0.017	(0.019)	0.018	0.024*	0.012
Market work hours	(0.046)	0.083	(0.020)	0.070	(0.058)	0.100	(0.105)	0.122	-0.208**	0.097
Market work hours squared	(0.203)	0.502	(0.038)	0.401	(0.090)	0.602	1.267*	0.704	1.431**	0.558
Age	0.016***	0.004	0.010***	0.003	-0.001	0.005	-0.020***	0.005	0.016***	0.003
Male	-0.251**	0.107	-0.013	0.086	-0.291**	0.135	-0.275*	0.145	-0.070	0.091
University education	-0.251	0.174	-0.281	0.206	0.308	0.191	-0.411*	0.211	-0.697***	0.209
Secondary education	-0.388**	0.185	-0.129	0.215	0.151	0.192	-0.240	0.222	-0.704***	0.208
In couple	0.167	0.119	0.002	0.080	-0.029	0.142	0.158	0.149	0.005	0.096
At least one child <18	-0.088	0.126	0.030	0.124	0.056	0.156	0.014	0.162	-0.089	0.132
Household size	0.181	0.128	-0.076	0.127	-0.275*	0.156	-0.195	0.175	0.046	0.125
Constant	4.804***	0.592	0.878	0.680	1.421	1.718	2.963***	0.776	2.158***	0.685
Sample size	2,670		2,670		2,670		2,670		2,670	
R-squared	0.092		0.067		0.091		0.087		0.120	

Notes: Robust standard errors clustered at the individual level in parentheses for columns (1) to (5). Sample consists of employees aged 21 to 65 from the *Well-Being Modules* of the American Time Use Survey 2010, 2012 and 2013. *Commuting* is the time devoted to "travel to or from work" and is measured in hours per day. The analysis is restricted to working days, defined as those with more than 60 minutes of market work, excluding commuting. Regressions also include industry, occupation, and state fixed effects. *Significant at the 90% level **Significant at the 95% level ***Significant at the 99% level.

Table 3
Feelings during non-commuting episodes, depending on commuting duration

	Happiness		Sadness		Stress		Fatigue		Pain	
	β	Robust SE	β	Robust SE	β	Robust SE	β	Robust SE	β	Robust SE
Self-care activities										
Total time in commuting	0.007	0.066	-0.021	0.045	-0.005	0.066	-0.046	0.084	-0.117*	0.068
Constant	2.546**	1.244	2.463***	0.920	3.831***	1.271	7.868***	1.393	6.339***	1.258
Sample size	629		629		629		629		629	
R-squared	0.481		0.481		0.443		0.332		0.508	
Market work activities										
Total time in commuting	0.052*	0.030	0.021	0.026	0.033	0.035	0.037	0.035	-0.006	0.029
Constant	3.672***	0.616	1.426***	0.427	3.017***	0.836	2.887***	0.746	1.759**	0.875
Sample size	3,774		3,774		3,774		3,774		3,774	
R-squared	0.069		0.063		0.103		0.081		0.094	
Non-market work activities										
Total time in commuting	-0.027	0.033	0.008	0.026	0.014	0.042	0.045	0.041	-0.021	0.033
Constant	6.441***	0.641	0.845*	0.503	-0.057	0.960	2.192***	0.622	0.317	0.433
Sample size	3,767		3,767		3,767		3,767		3,767	
R-squared	0.086		0.127		0.101		0.123		0.094	
Child care activities										
Total time in commuting	0.020	0.038	0.062**	0.025	0.010	0.050	0.126**	0.054	0.068*	0.039
Constant	6.178***	0.757	0.810	0.896	0.112	0.970	1.935*	1.037	-0.098	0.709
Sample size	1,584		1,584		1,584		1,584		1,584	
R-squared	0.186		0.134		0.161		0.246		0.126	
Leisure activities										
Total time in commuting	-0.026	0.028	0.012	0.021	0.036	0.025	0.054	0.038	0.027	0.024
Constant	4.967***	0.539	-0.866*	0.444	-0.569	0.466	1.693**	0.758	-0.259	0.506
Sample size	7,368		7,368		7,368		7,368		7,368	
R-squared	0.069		0.083		0.056		0.087		0.088	

17

21

18   *Notes:* Robust standard errors clustered at the individual level in parentheses. Sample consists of employees aged 21 to 65 from the *Well-Being Modules* of the American
19   Time Use Survey 2010, 2012 and 2013. *Commuting* is the time devoted to "travel to or from work" and is measured in hours per day. The analysis is restricted to working
20   days, defined as those with more than 60 minutes of market work, excluding commuting. Regressions also include industry, occupation, and state fixed effects. *Significant
21   at the 90% level **Significant at the 95% level ***Significant at the 99% level.
22

APPENDIX

Table A1

Classification of activities, Well-Being Module of the American Time Use Survey

Commuting	180501
Self-care activities	
Eating/Personal care	50202; 110199; 110201; 110203; 110204; 110299; 119999; 10201; 10299; 500105; 10401; 10499; 10599; 19999; 80501; 80502; 80599; 160105; 80401; 80402; 80403; 80499
Own medical care	10301; 10399; 10501
Travel for personal care	180101; 180199; 181101
Market work activities	
Main work	50101; 50199 ; 50299 ; 59999 ; 50205 ; 50101 ; 50199 ; 50299 ; 59999 ; 50205 ; 50102 ; 50301 ; 50302 ; 50303 ; 50304 ; 50305; 50399
Job search	50401; 50402; 50403; 50404; 50405; 50499; 180504
Other work/edu. related act.	180502; 50201; 50203; 50103; 50104; 50204; 60101; 60103; 60104; 60199; 60301; 60302; 60303; 60399; 60204; 60102; 60299; 60201; 60202; 60203; 60204; 60401; 60402; 60403; 60499; 69999; 160103 180601; 180602; 180603; 180604; 180699
Non-market work activities	
Cooking/preparing meals	20201; 20202; 20203; 20299
Housework	20101; 20301; 20399; 20401; 20102; 20103
Home/car maintenance	20302; 20303; 20402; 20499; 20502; 20701; 20799; 20801; 20899
Other housework	20104; 20199; 20901; 20902; 20905; 20999; 29999; 180801; 180899; 180901; 180999; 181001; 181099; 180201; 180299; 180701; 180799; 180401; 180499; 180304; 180305; 180202; 180203; 180204; 180205; 180206; 180207; 180208; 180209; 180402; 180403; 180404; 180405; 180702; 180703; 180704; 180802; 180803; 180804; 180805; 180806; 180807; 180902; 180903; 180905; 181002
Purchasing goods	70101; 70103; 70104; 70105; 90102; 70102; 70199; 70201; 70299; 70301; 70399; 79999; 160104; 80701; 80702; 80799; 90101; 90103; 90104; 90199; 90201; 90202; 90299; 90301; 90302; 90399; 90401; 90402; 90499; 90501; 90502; 90599; 99999; 160106; 80201; 80202 ; 80203; 80299 ; 100101; 100102; 100103; 100199; 100301; 100302; 100304; 100399; 100401; 100499; 109999; 160108; 160104; 80301; 80302; 80399; 80601; 80602; 80801; 80899; 89999; 80699
Adult care	30401; 30402; 30403; 30404; 30405; 30499; 30501; 30502; 30503; 30504; 30599; 40101; 40102; 40103; 40104; 40106; 40107; 40108; 40109; 40110; 40111; 40112; 40199; 40201; 40202; 40203; 40204; 40299; 40301; 40302; 40303; 40399; 40401; 40402; 40403; 40404; 40405; 40499; 40501; 40502; 40503; 40504; 40505; 40506; 40507; 40508; 40599; 49999
Travel for housework	
Child care activities	
Basic child care	30101; 30108; 30109; 30199; 80101; 80102; 80199; 160107; 30301; 30302; 30303; 30399
Edu./supervisory childcare	30104; 30107; 30201; 30202; 30203; 30204; 30299; 30102; 30106; 30103; 30110; 30111; 30112; 39999
Travel for childcare	180301; 180399; 180302; 180303
Leisure activities	
Voluntary activities	150101; 150102; 150103; 150104; 150105; 150106; 150199; 150201; 150202; 150203; 150204; 150299; 150301; 150302; 150399; 150401; 150402; 150499; 150501; 150599; 150601; 150602; 150699; 159999; 150701; 150799; 150801; 150899; 100201; 100299; 100305; 140101; 140102; 140103; 140104; 140105; 149999
Gardening/pet care	20501; 20599 ; 20601 ; 20602 ; 20699
Travel for leisure	181401; 181499; 181501; 181599; 181201; 181299; 181301; 181399; 181601; 181699; 181801; 181899; 189999; 500103; 181202; 181203; 181204; 181205; 181302
TV watching	120303; 120304
Out-of-home leisure	120405; 120499; 120504; 130201; 130299; 130302; 130399; 130402; 130499; 120403; 120401; 120402; 110202; 110101; 110199; 120404; 120201; 120202; 120299 ; 130202; 130203; 130204; 130205; 130206; 130209; 130210; 130213; 130214; 130215; 130216; 130218; 130219; 130222; 130224; 130225; 130226; 130227; 130229; 130232
Sports/exercise	130101; 130102; 130103; 130105; 130107; 130109; 1301010; 130111; 130113; 130114; 130115; 130117; 130118; 130119; 130120; 130121; 130122; 130123; 130124; 130125; 130126; 130127; 130128; 130129; 130130; 130132; 130133; 130199; 130301; 130401; 139999; 130131; 130104; 130108; 30105; 40105; 130106; 130112; 130116; 130118; 130110; 130134; 130136
At-home leisure	120101; 120199; 120307; 129999; 120313; 120309; 120310; 120311; 120301; 120302; 120399; 120501; 120502; 120503; 120599
Reading/listening	120312; 120306; 120305
Writing/paperwork	20903; 160101; 160102 ; 160201; 160201; 160299; 169999; 20904; 120308; 160199

Table A2
Feelings during self-care activities

	Happiness		Sadness		Stress		Fatigue		Pain	
	β	Robust SE	β	Robust SE	β	Robust SE	β	Robust SE	β	Robust SE
Hourly wage	-0.001	0.026	0.001	0.016	-0.013	0.025	-0.036	0.029	-0.016	0.024
Hourly wage squared	-0.016	0.035	-0.024	0.021	0.030	0.036	0.056	0.038	-0.018	0.029
Market work hours	0.334**	0.143	0.133	0.093	-0.155	0.127	-0.203	0.172	-0.074	0.183
Market work hours squared	-3.141***	1.032	-1.304**	0.657	1.414	0.895	2.361*	1.211	-0.039	1.177
Age	0.015*	0.008	0.003	0.007	0.001	0.008	0.000	0.009	0.009	0.009
Male	0.338*	0.205	-0.236	0.154	-0.807***	0.239	-0.883***	0.258	-0.370	0.246
University education	-0.384	0.438	-0.679	0.488	0.399	0.446	-0.040	0.514	-0.267	0.529
Secondary education	0.117	0.447	-0.896*	0.499	-0.220	0.461	-0.256	0.528	-0.809	0.531
In couple	0.514**	0.229	0.176	0.151	-0.352	0.246	-0.173	0.289	0.038	0.227
At least one child <18	-0.198	0.298	0.675***	0.193	0.664**	0.275	0.889***	0.330	0.909***	0.338
Household size	0.165	0.227	-0.878***	0.209	-0.461*	0.264	-0.629*	0.342	-0.929***	0.322
Constant	2.546**	1.244	2.463***	0.920	3.831***	1.271	7.868***	1.393	6.339***	1.258
Sample size	629		629		629		629		629	
R-squared	0.481		0.481		0.443		0.332		0.508	

Table A3
Feelings during market work activities

	Happiness		Sadness		Stress		Fatigue		Pain	
	β	Robust SE	β	Robust SE	β	Robust SE	β	Robust SE	β	Robust SE
Hourly wage	0.014	0.009	-0.004	0.008	-0.014	0.011	-0.017	0.011	-0.032***	0.009
Hourly wage squared	-0.023*	0.012	0.002	0.010	0.024	0.015	0.019	0.014	0.033***	0.011
Market work hours	-0.037	0.071	-0.012	0.053	0.087	0.081	-0.171**	0.080	-0.025	0.067
Market work hours squared	-0.020	0.381	0.089	0.290	0.092	0.440	1.458***	0.440	0.260	0.379
Age	0.013***	0.003	0.006**	0.003	-0.006	0.004	-0.008**	0.004	0.015***	0.003
Male	-0.093	0.086	-0.077	0.077	-0.414***	0.104	-0.365***	0.095	-0.175**	0.077
University education	-0.298*	0.163	-0.549***	0.179	-0.004	0.205	-0.372*	0.191	-0.205	0.163
Secondary education	-0.079	0.159	-0.571***	0.178	-0.338*	0.204	-0.427**	0.193	-0.256	0.160
In couple	-0.074	0.094	0.035	0.083	0.293**	0.120	0.096	0.113	0.146	0.092
At least one child <18	0.097	0.104	-0.064	0.089	-0.268**	0.127	0.023	0.121	0.017	0.094
Household size	0.122	0.097	-0.107	0.083	-0.074	0.125	-0.005	0.118	-0.155*	0.092
Constant	3.672***	0.616	1.426***	0.427	3.017***	0.836	2.887***	0.746	1.759**	0.875
Sample size	3,774		3,774		3,774		3,774		3,774	
R-squared	0.069		0.063		0.103		0.081		0.094	

Notes: Robust standard errors clustered at the individual level in parentheses. Sample consists of employees aged 21 to 65 from the *Well-Being Modules* of the American Time Use Survey 2010, 2012 and 2013. *Commuting* is the time devoted to "travel to or from work" and is measured in hours per day. The analysis is restricted to working days, defined as those with more than 60 minutes of market work, excluding commuting. Regressions also include industry, occupation, and state fixed effects. *Significant at the 90% level **Significant at the 95% level ***Significant at the 99% level.

Table A4
Feelings during non-market work activities

	Happiness		Sadness		Stress		Fatigue		Pain	
	β	Robust SE	β	Robust SE	β	Robust SE	β	Robust SE	β	Robust SE
Hourly wage	0.000	0.007	-0.008	0.006	-0.009	0.008	-0.015*	0.008	-0.017**	0.007
Hourly wage squared	0.000	0.005	0.008*	0.004	0.007	0.006	0.010	0.007	0.014**	0.006
Market work hours	0.024	0.068	-0.013	0.054	0.057	0.076	0.051	0.080	0.044	0.058
Market work hours squared	-0.064	0.483	-0.001	0.381	-0.482	0.562	0.266	0.607	-0.155	0.429
Age	-0.003	0.004	0.012***	0.003	0.005	0.005	-0.003	0.005	0.013***	0.004
Male	-0.125	0.110	-0.110	0.082	-0.326**	0.128	-0.546***	0.127	-0.317***	0.099
University education	-0.408*	0.212	-0.485***	0.187	0.129	0.220	0.512**	0.248	-0.463**	0.217
Secondary education	-0.301	0.217	-0.347*	0.191	0.051	0.231	0.464*	0.250	-0.099	0.224
In couple	0.244**	0.120	-0.099	0.092	0.130	0.122	-0.098	0.143	0.161	0.102
At least one child <18	-0.082	0.124	0.049	0.101	0.276**	0.140	0.236	0.163	0.076	0.129
Household size	-0.123	0.128	-0.037	0.102	0.084	0.134	0.134	0.148	-0.053	0.110
Constant	6.441***	0.641	0.845*	0.503	-0.057	0.960	2.192***	0.622	0.317	0.433
Sample size	3,767		3,767		3,767		3,767		3,767	
R-squared	0.086		0.127		0.101		0.123		0.094	

Notes: Robust standard errors clustered at the individual level in parentheses. Sample consists of employees aged 21 to 65 from the *Well-Being Modules* of the American Time Use Survey 2010, 2012 and 2013. *Commuting* is the time devoted to "travel to or from work" and is measured in hours per day. The analysis is restricted to working days, defined as those with more than 60 minutes of market work, excluding commuting. Regressions also include industry, occupation, and state fixed effects. *Significant at the 90% level **Significant at the 95% level ***Significant at the 99% level.

Table A5
Feelings during child care activities

	Happiness		Sadness		Stress		Fatigue		Pain	
	β	Robust SE	β	Robust SE	β	Robust SE	β	Robust SE	β	Robust SE
Hourly wage	-0.013	0.008	0.000	0.005	0.023**	0.009	0.014	0.011	-0.021***	0.007
Hourly wage squared	0.012	0.007	-0.001	0.005	-0.021**	0.008	-0.017*	0.010	0.017***	0.006
Market work hours	-0.087	0.067	-0.056	0.057	0.117	0.099	0.102	0.095	-0.147*	0.080
Market work hours squared	0.967**	0.468	0.149	0.404	-1.251*	0.652	-0.375	0.632	1.185**	0.535
Age	-0.017***	0.006	0.011**	0.005	0.007	0.008	-0.013	0.010	0.010	0.008
Male	0.276**	0.117	-0.233***	0.078	-0.477***	0.152	-0.618***	0.190	-0.239**	0.115
University education	-0.585***	0.180	-0.020	0.207	-0.043	0.315	0.374	0.402	0.014	0.287
Secondary education	-0.624***	0.194	0.084	0.217	-0.254	0.327	0.420	0.380	0.319	0.299
In couple	0.230	0.156	0.111	0.119	-0.080	0.192	0.242	0.213	0.285*	0.151
At least one child <18	0.504	0.474	-0.655	0.682	-0.090	0.599	0.319	0.750	0.407	0.312
Household size	-0.146	0.161	-0.041	0.135	0.038	0.221	-0.338	0.249	-0.128	0.197
Constant	6.178***	0.757	0.810	0.896	0.112	0.970	1.935*	1.037	-0.098	0.709
Sample size	1,584		1,584		1,584		1,584		1,584	
R-squared	0.186		0.134		0.161		0.246		0.126	

Table A6
Feelings during leisure activities

	Happiness		Sadness		Stress		Fatigue		Pain	
	β	Robust SE	β	Robust SE	β	Robust SE	β	Robust SE	β	Robust SE
Hourly wage	-0.012*	0.007	0.002	0.005	0.001	0.006	0.015	0.009	-0.003	0.006
Hourly wage squared	0.009	0.007	-0.005	0.005	0.000	0.006	-0.022**	0.010	0.002	0.005
Market work hours	0.023	0.054	0.036	0.040	-0.009	0.050	-0.028	0.075	-0.044	0.063
Market work hours squared	-0.161	0.386	-0.288	0.265	0.171	0.343	0.972**	0.486	0.272	0.406
Age	0.003	0.003	0.013***	0.003	0.005*	0.003	-0.006	0.005	0.014***	0.004
Male	-0.081	0.089	-0.206***	0.074	-0.279***	0.083	-0.404***	0.113	-0.203**	0.079
University education	-0.185	0.150	0.034	0.119	0.073	0.140	0.316	0.203	-0.061	0.134
Secondary education	-0.201	0.144	0.073	0.117	0.099	0.135	0.362*	0.195	0.086	0.143
In couple	0.251***	0.095	-0.145	0.090	-0.102	0.094	0.085	0.125	0.012	0.094
At least one child <18	0.128	0.106	0.114	0.084	0.185*	0.096	0.156	0.126	0.161*	0.094
Household size	0.053	0.106	-0.033	0.093	-0.005	0.107	0.068	0.133	-0.110	0.108
Constant	4.967***	0.539	-0.866*	0.444	-0.569	0.466	1.693**	0.758	-0.259	0.506
Sample size	7,368		7,368		7,368		7,368		7,368	
R-squared	0.069		0.083		0.056		0.087		0.088	

Notes: Robust standard errors clustered at the individual level in parentheses. Sample consists of employees aged 21 to 65 from the *Well-Being Modules* of the American Time Use Survey 2010, 2012 and 2013. *Commuting* is the time devoted to "travel to or from work" and is measured in hours per day. The analysis is restricted to working days, defined as those with more than 60 minutes of market work, excluding commuting. Regressions also include industry, occupation, and state fixed effects. *Significant at the 90% level **Significant at the 95% level ***Significant at the 99% level.