

## Analyzing the association between satisfaction with commuting time and satisfaction with life domains: A comparison of 32 European countries

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**Abstract:** Although the majority of literature explains travel satisfaction by examining trip determinants, the interaction between travel satisfaction and satisfaction with other life domains has been analyzed less frequently. Accounting for satisfaction with other life domains is nevertheless important because the effect of trip characteristics on travel satisfaction may be overestimated without considering satisfaction with non-travel-related life domains. Hence, this paper examines the interaction between satisfaction with commuting time, satisfaction with other life domains and overall life satisfaction. An ordered logistic regression has been estimated using a large dataset comprising data from 32 European countries. Results indicate that satisfaction with specific life domains and overall life satisfaction have a significant association with commuting time satisfaction (CTS), while controlling for employment characteristics, and personality (i.e., trust). Of all life domains, job and time-use satisfaction have the strongest associations with CTS. Given the large dataset, we controlled for the contextual differences between the European countries by making a distinction between well- and less-developed countries. The result seems to suggest that all life domains and employment characteristics better explain CTS in well-developed countries than less-developed countries. This paper thus contributes to reporting other innovative ways to obtain high levels of commuting time satisfaction rather than only looking at the interactions with transport mode, travel distance and travel time.

**Keywords:** Commuting satisfaction, satisfaction with life, satisfaction with life domains, employment characteristics, less- and well-developed European countries

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## 1 Introduction

Since 2010, several studies have explained travel satisfaction by examining trip determinants like transport mode, travel distance, travel time (De Vos et al., 2016; St-Louis et al., 2014;), the built environ-

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ment (Mouratidis et al., 2019), and subjective characteristics like attitudes and personality traits (Gao et al., 2017; Ye & Titheridge, 2017). Very little attention is paid to the interactions between travel satisfaction and satisfaction with other life domains (a few exceptions can be found in Gao et al., 2017; Kroesen, 2014). This is rather surprising since daily travel largely depends on the decisions we make regarding other life domains like where to live and work, how to commute, how to spend the leisure time, and how to distribute daily time-use. Accounting for satisfaction with other life domains is nevertheless important because it is not only the trip characteristics that explain travel satisfaction but also the interaction of satisfaction with other non-travel-related life domains that explain travel satisfaction. Not controlling for this association between travel satisfaction and other life domain satisfaction may have introduced important biases in the results of travel satisfaction.

Furthermore, there is extensive literature on how satisfied people are with their daily travel in general. However, what is less explored is the satisfaction with the time component of travel. It is nevertheless important to examine satisfaction with travel time due to the concept of travel as derived demand and positive utility of travel time. Although travel is generally considered a disutility that needs to be minimized, people still travel as it can provide certain physical and emotional benefits (Mokhtarian & Salomon, 2001). For example, the commute to work can act as a transition between personal and professional life (Redmond & Mokhtarian, 2001). This explains that travel time is not necessarily a source of disutility that needs to be minimized but should be studied in combination with satisfaction with other specific life domains.

To fill these two research gaps, this article analyses the interaction between commuting time satisfaction (CTS) and satisfaction with multiple life domains using data from the 2013 European Union Statistics on Income and Living Conditions (EU-SILC) survey. To our knowledge, this is one of the only dataset that includes not only the satisfaction with commuting time, but also the satisfaction with several other life domains. Moreover, this survey collected data from 32 European countries, allowing for a cross-sectional country comparison. Satisfaction with commuting may differ from country to country due to contextual differences (e.g., by income level, as commuting may allow people in some "rich" countries to earn higher wages than in other countries). This paper will therefore distinguish between well-developed and less-developed countries based on the Human Development Index (HDI).

In doing so, this paper will answer two research questions: (i) what is the interaction between CTS and satisfaction with other life domains, while controlling for covariates?; and (ii) how is this interaction influenced by contextual differences across EU32 countries? The remaining paper is organized as follows. Section 2 provides a review of the literature on commuting satisfaction. Section 3 describes the dataset and the methodology used. Results are presented and discussed in Section 4. Section 5 finally summarizes the main findings and provides avenues for future research.

## 2 Literature review: Factors affecting Commuting Satisfaction

Over the past years, many studies have provided interesting insights into the relationship between travel satisfaction and its main determinants (for an overview, see Ettema et al., 2016). In this study, travel satisfaction is limited to commuting satisfaction. First, we describe the direct and indirect effects of some frequently researched determinants of commute satisfaction such as transport mode, travel distance and travel time. Next, we present the influence of some less frequently studied, but relevant, variables such as employment characteristics and personality.

## 2.1 Commuting satisfaction and its key determinants

Commuting is one of the least enjoyable activities (Kahneman et al., 2004) and is labelled “the stress that doesn’t pay” (Stutzer & Frey, 2004). Previous studies have indicated that this is due to (but not limited to) the influence of trip characteristics, built environment, subjective and socio-demographic characteristics. Amongst all determinants, **trip characteristics** (mode, distance and time) seem to have an important effect on commuting satisfaction. For instance, active modes of transport suggest higher satisfaction levels with commuting than motorized and public transport (De Vos et al., 2016; Legrain et al., 2015; Mao et al., 2016; Morris & Guerra, 2015; Ye & Titheridge, 2017), whereas train users present higher satisfaction with commuting than bus users (Handy & Thigpen, 2018; St-Louis et al., 2014). De Vos and Witlox (2017) pointed out that the reason for these differences in the transport mode choice is still unclear and could partly be explained in the future by incorporating more qualitative research. From quantitative research, we understand that active travelers are most satisfied because they do not suffer from traffic congestion, whereas car users are mostly annoyed by travel elements like congestion, experienced traffic safety, parking availability. (Ettema et al., 2013; Morris & Hirsch, 2016). Likewise, public transport users associate their satisfaction with elements like comfort, cleanliness, safety and reliability of the system (van Lierop & El-Geneidy, 2016). Moreover, trip distance also has an important effect on satisfaction with daily travel (be it positive or negative), depends on the built environment characteristics, subjective characteristics and socio-demographics (Handy & Thigpen, 2018; Mokhtarian et al., 2015; Ye & Titheridge, 2017).

Another trip characteristic that has a direct impact on commuting satisfaction is travel time. There is extensive literature that longer commute time reduces commuting satisfaction and increases negative feelings such as stress, tiredness, worries (Mokhtarian et al., 2015; Morris & Guerra, 2015). Since satisfaction could be an indicator of individual’s perceived utility, commuting time can be associated with both positive utility and disutility. Although Redmond and Mokhtarian (2001) pointed out the positive utility of time, most commuters aspire to a shorter commute time than the actual commute time. Several other studies analyzed the ideal commute time (ICT) versus actual commute time (ACT) and found that on average ICT is usually less than ACT (Milakis & van Wee, 2018; Zhao et al., 2012). Among them, many commuters have higher satisfaction with their commute time when the ACT is + 5 minutes than their ICT. Nevertheless, Humagain and Singleton (2020) reported that a large proportion of their sample (80%) were dissatisfied with their commuting time because the difference between their ACT and ICT was much more than 5 minutes. On similar lines, Ye et al. (2020) found that respondents having a commute time close to (or below) their ICT (35.6% of the respondents) had significantly higher levels of commuting satisfaction compared to those travelling longer than ICT (64.4% of the respondents). Higgins et al. (2018) also obtained similar results. In general, these studies observed a negative association between longer commute time and commuting satisfaction. Additional downsides of longer commute time are less time spent with family members (Christian, 2012), less time spent on leisure activities and physical activities (Hilbrecht et al., 2014; Lorenz, 2018), and less time spent on sleeping (Nie & Sousa-Poza, 2018). This explains that commute time can either be a source of disutility that people want to minimize or can be associated with positive benefits that people desire. Based on this, it seems imperative to explore **satisfaction with the time component of travel**, specifically commute time.

In addition to trip characteristics, the **built environment** also has an indirect influence on commuting satisfaction, mediated through trip characteristics, especially transport mode (Handy & Thigpen, 2018; Ye & Titheridge, 2017). For instance, Mao et al. (2016) found an indirect effect of urban density on commuting satisfaction through transport mode in Beijing. They reported that the use of active transport in denser areas are associated with higher satisfaction with commuting. Mouratidis et al.

(2019) obtained similar results, noting higher travel satisfaction among commuters who travel shorter distances by active transport in dense urban areas. Hook et al. (2021) reported that built environment characteristics play an important role in determining travel satisfaction because trip characteristics and other travel-related elements are highly dependent on the characteristics of the residential built environment. A few studies have also suggested an influence of **subjective characteristics** like attitudes towards travel, personality and mood during travel on satisfaction with commuting (De Vos et al., 2019; Mokhtarian et al., 2015). For instance, travel attitudes have a direct effect on commuting satisfaction (Abou-Zeid et al., 2012; Manaugh & El-Geneidy, 2013; Zeid, 2009). The authors suggested that if people travel with their preferred mode of transport, they indicate a higher satisfaction level with their travel. Handy and Thigpen (2018) obtained similar results. Apart from travel attitudes, mood during travel also impacts commuting satisfaction. It is especially true for commuting trips where Zhu and Fan (2018) found commuting trips to be associated with negative feelings, in contrast to non-commuting trips, which seem to be more relaxed and enjoyable. Lancée et al. (2017) pointed out that a combination of commuting time and commuting mode increases negative feelings during the commute, whereas an increase in commuting time can even uplift the mood when commuting by active modes of transport. On the other hand, Mokhtarian et al. (2015) reported that only 8% of the total trips in France were tiring and less than 4% were unpleasant, suggesting that travel is not always obnoxious. In general, mood during travel has a short-term effect on commuting satisfaction. However, another important factor that has a long-term effect on commuting satisfaction is overall life satisfaction.

**Life satisfaction** or subjective well-being (SWB) is a concept closely related to happiness and, has been a topic of research in social and psychological science for decades (for an overview, see Diener et al., 1999). Several studies have pointed out the relationship between life satisfaction and travel satisfaction (Bergstad et al., 2011; De Vos et al., 2013; Ettema et al., 2010). However, less is known about the indirect effect of life satisfaction through domain-specific satisfaction on commute satisfaction (a few exceptions can be found in Gao et al., 2017; Kroesen, 2014; Mouratidis, 2020). Accounting for satisfaction with other life domains is nevertheless important because it might be an overestimation to conclude the effect of life satisfaction on travel satisfaction without considering the interactions of satisfaction with other daily non-travel-related life domains. Not doing so may have introduced important biases in the results on travel satisfaction so far.

## 2.2 Commuting satisfaction and some less frequently studied determinants

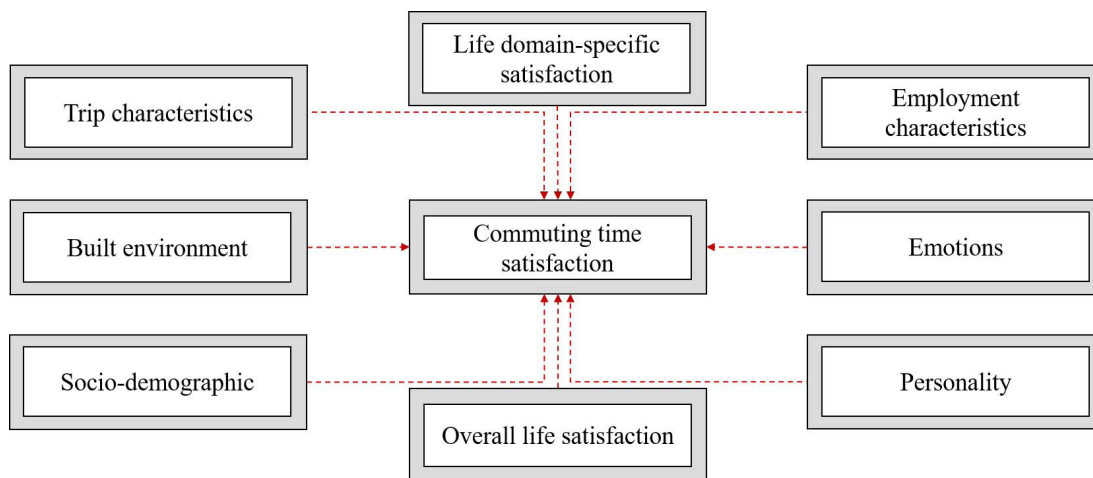
Apart from the main determinants of commuting satisfaction, there are some less frequently studied but relevant determinants that could also affect satisfaction with commuting. It is somewhat strange that not many studies pay attention to the employment characteristics of the individuals because people are mostly obliged to commute to work, and the activities at the destination may influence people's satisfaction with commuting time (Bergstad et al., 2011; De Vos et al., 2013; Ettema et al., 2010).

Past studies analyzed the effect of employment characteristics on job satisfaction. For instance, some studies reported temporary employees to be less satisfied with their jobs compared to permanent employees (Bruno et al., 2013; Graaf-Zijl, 2005; Waaijer et al., 2016). Clark et al. (2020) pointed out that home-workers (or workers with zero commute) have higher job satisfaction in comparison to those who do not work from home. Some studies even analyzed the impact of commuting behavior or commuting satisfaction on job satisfaction (Amponsah-Tawiah et al., 2016; Chatterjee et al., 2020; Mouratidis, 2020). For instance, Amponsah-Tawiah et al. (2016) observed an indirect and negative effect of commuting stress on job satisfaction, through burnout.

However, it also seems plausible that employment characteristics other than job satisfaction can have a spillover effect on satisfaction with the daily commute to work. After all, people who are satisfied

with their work characteristics might also report higher levels of satisfaction with their daily commute to work. There are only two studies that analyze the effect of employment characteristics on commuting satisfaction. Lucas and Heady (2002) found no significant relationship between flexitime working environments and commuting satisfaction, whereas, Morris and Guerra (2015) found the total affect scores (positive and negative) of work-related travel to be lower than other non-work-related travel. Other studies also analyzed the relationship between workplace satisfaction, workplace attachment, workplace environment and design, and satisfaction with the commute (Gerber et al., 2020; Haapakangas et al., 2018; Phillips et al., 2010; Spreckelmeyer, 1993; Wallmann-sperlich et al., 2019). However, workplace attachment and workplace satisfaction are not indicative of an individual’s employment characteristics. These are rather a separate life domain. Therefore, we understand that not many studies have analyzed the relationship between employment characteristics and commuting satisfaction, which is surprising because people commute to participate in their work activity and work activity can largely influence their satisfaction with commuting.

From this viewpoint, and for a holistic conceptualization, this study attempts to understand the role of employment characteristics, multiple life domains and personality on CTS. These unusual variables could be a new addition to the commuting satisfaction literature. To the best of our knowledge, no study exists that demonstrates these relationships. Commuting satisfaction was always analyzed using transport variables, built-environment and subjective characteristics. However, people have to commute because their place of residence and workplace are often spatially separated. Therefore, this paper aims to fill the current gap by analyzing the interactions between commuting time satisfaction (CTS) on one hand and satisfaction with multiple life domains on the other hand, while also controlling for employment characteristics, personality and socio-demographics (see also the conceptual model in Figure 1).



**Figure 1.** Conceptual model for commuting time satisfaction

### 3 Research design

#### 3.1 Sample

The dataset used for this study is the 2013 module of the European Union Statistics on Income and Living Conditions (EU-SILC). In this module on “Well-being and Satisfaction”, respondents are asked about their quality of life and SWB, their satisfaction with multiple life domains (among others CTS)

and their socio-demographics. In total, 600,000+ respondents from 32 European countries participated in this survey. The sample is representative of the European population, irrespective of their country of origin Eurostat (2018). For this paper, only employed people were included in the analysis (117,041 respondents). Respondents who are unemployed, unfit to work, retired or inactive were excluded from the analysis because these people do not commute to work, and therefore do not report a CTS score. Although this survey dates back to 2013, it still has multiple benefits. First, it allows us to study the interaction between CTS and domain-specific satisfaction. Second, this dataset allows for a cross-sectional countries' comparison. The only disadvantage of this dataset is the absence of mainstream travel behavior variables like mode, distance and time. We are aware that this is a limitation of this dataset, but at the same time, it provides ample opportunities to study the interactions between CTS and satisfaction with other life domains.

Our sample has an even distribution of males and females. The mean age of the respondents is 43.5 years which corresponds to the largest category of respondents being in the adult category ( $\leq 50$  and  $\geq 30$  years) followed by older adults ( $> 50$  years) and young adults ( $< 30$  and  $> 15$  years). The majority of our respondents are married (60%). Two-third of the respondents do not have a university degree. Around 85% of our sample owns a car. The survey did not ask about the commuting mode and, consequently, we do not know if respondents use their cars to commute to work. However, previous studies suggest that an increase in household car ownership triggers a change in individuals' travel behavior, which in turn leads to an increase in commuting by car (Clark, 2012; Clark et al., 2016; Dargay & Hanly, 2007). Therefore, we assumed that car ownership is a proxy for commuting mode. Furthermore, almost 40% of the respondents live in urban areas, whereas the remaining 60% is divided almost equally over suburban and rural areas. Respondents were also asked to rate their general health. One fourth reported having bad health.

Since the EU-SILC survey is organized in 32 European countries, results can be impacted by contextual differences between these countries. We took that into account by making a distinction between well-developed and less-developed countries using the Human Development Index (HDI). Countries with an HDI score of  $\geq 0.89$  were classified as well-developed countries, whereas those with a score of  $< 0.89$  were classified as less-developed countries. The cut-off point of 0.89 was determined using the median value of HDI. This classification was necessary because it might be an over-exaggeration to treat all 32 European countries in the same way as these countries have different socioeconomic and demographic contexts. These contextual differences are captured by the HDI as this index combines income, the standard of living, education, and health parameters.

### 3.2 Measurement of key variables

The dependent variable in this paper is commuting time satisfaction (CTS). Respondents were asked to rate their degree of satisfaction with their commuting time to work. CTS was measured on an 11-point Likert scale ranging from 0 - "very dissatisfied" to 10 - "very satisfied." The average score on this scale is 7.46. It illustrates that majority of the respondents are satisfied with their commuting time. The independent variables in this study are (i) satisfaction with life in general and specific life domains, (ii) employment characteristics, and (iii) subjective characteristics like emotions and trust. The life domains included satisfaction with the job, financial situation, time-use, accommodation, personal relationship, recreational space, living environment, and overall life satisfaction. Respondents were asked to rate their satisfaction with overall life and specific life domains on an 11-point Likert scale ranging from 0 - "very dissatisfied" to 10 - "very satisfied." On average, respondents were found to be least satisfied with their financial situation (6.3) and most satisfied with personal relationships (8.0), while life satisfaction had an average score of 7.3. A Spearman's correlation test indicated significant correlations ( $p < 0.05$ ) between

CTS, overall life satisfaction and satisfaction with specific life domains.<sup>1</sup>

Employment characteristics were measured by three variables: (i) full-time (>30 h per week) vs part-time employees (<35 h per week)<sup>2</sup>, (ii) change in employment status from unemployment/inactivity/retirement to employment vs no change, and (iii) temporary vs permanent employee. Respondents were asked to indicate their current employment characteristics. The majority of respondents work as a full-time employee (84%) and has a permanent contract (89%). Only a small amount of respondents experienced a recent change in their employment status (5%).<sup>3</sup>

Regarding emotions, respondents were asked to indicate their feelings in the last four weeks on a 5-point Likert scale (all/most/some of the time to a little/none of the time). Negative feelings included being nervous, feeling down and in the dump, and feeling downhearted or depressed, whereas positive feelings comprised feeling calm and peaceful, and being happy. Although it can be argued that happy and calm/peaceful are different types of positive feelings (i.e., positive activation versus positive deactivation (Mokhtarian, 2019)), due to their internal consistency (Cronbach alpha = 0.79), we combined them into a new variable "Positive feelings." Similar results were observed with negative feelings (Cronbach alpha = 0.68) and a new variable "Negative feelings" was created.

Respondents were also asked to rank their trust on an 11-point Likert scale with 0 "no trust" and 10 "complete trust." Trust included trust in the police, the political and legal system. Due to their internal consistency (Cronbach alpha value = 0.85), a new variable "Trust" was created. Since it is a personality trait (Deneve & Copper, 1998), we included it in our analysis. It is uncommon in the literature on commuting satisfaction but could also be relevant because people with a happy personality might evaluate their commuting more positively compared to those with a negative personality. We also controlled for socio-demographic variables like age, gender, education, and marital status.

### 3.3 Methodology

Commuting time satisfaction (CTS), the dependent variable in our analysis is ordinal. For that reason, we estimated an ordered logistic regression using the STATA *ologit* module. To control for the contextual differences, we estimated three logistic models using a maximum likelihood estimation technique. The first model is based on the entire sample (Model 1,  $n = 117,041$ ). The second model only includes respondents from less-developed countries (Model 2,  $n = 55,494$ ), whereas the third model only includes respondents from well-developed countries (Model 3,  $n = 61,547$ ). Sample sizes of these three models are very large which may result in the "p-value problem" meaning that p-values quickly go to zero and might falsely indicate significant associations (Lin et al., 2013). One solution for this is to apply bootstrapping (Fang & Ma, 2017). Bootstrapping is a resampling method that uses random sampling with replacement from the original sample. In doing so, it provides more robust p-values. Since all the models consist of multiple covariates, we checked for multicollinearity by calculating the variance infla-

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<sup>1</sup> We performed Spearman's correlation analysis to measure the associations between CTS and the life domain variables. The analysis reveals  $r = .20$  for overall-life satisfaction,  $r = .21$  for satisfaction with the financial situation,  $r = .18$  for accommodation satisfaction,  $r = .27$  for job satisfaction,  $r = .26$  for time-use satisfaction,  $r = .16$  for personal relationship satisfaction,  $r = .16$  for recreational space satisfaction and  $r = .18$  for living environment satisfaction All values are at  $p < .05$  level of significance.

<sup>2</sup> There is an overlap between these two categories. It is impossible to establish an exact distinction between full-time and part-time work. This is due to the variations in the measurement across the EU32. Based on the spontaneous answers of the respondents, they were assigned to one of these two categories.

<sup>3</sup> We performed three Mann-Whitney U tests to compare the mean CTS value between respectively, full-time and part-time workers, respondents with and without a change in employment status; and permanent and temporary employee. Each time there are significant differences ( $p < 0.01$ ) between both groups.

tion factor (VIF). The VIF for all the predictors is  $< 10$  (mean VIF = 1.39). Therefore, we do not foresee any problem of multicollinearity. We also reported the log-likelihood ratio and McFadden's Pseudo  $R^2$  values for analyzing the goodness of fit. Furthermore, we conducted an independent validity check of the full model using the estimation sample and found an 80.99% average correctly predicted values in the model, thereby demonstrating a good model.

## 4 Results and discussion

We first focus on the results of the entire sample (Model 1) and then discuss differences between less-developed and well-developed countries (Model 2 and Model 3). The results for the three models are demonstrated in Table 1. Out of these models, Model 2 obtains a slightly better model fit than Model 3 with McFadden's Pseudo  $R^2$  improved from 0.044 to 0.069 with the same degree of freedom (24) and a log-likelihood ratio of  $< 0.0001$ . It implies that both models have comparable complexity and the increase in  $R^2$  values in Model 2 is not due to adding more variables. Although the  $R^2$ -value of all the models is less than 0.2, which is a minimum score representing good model fit (McFadden, 1999), we still consider that the model for less-developed countries explains the association between CTS and the other variables in a slightly better way.

### 4.1 CTS and satisfaction with life and life domains

Results from Model 1 indicate a significant association between CTS and satisfaction with other life domains like job, time-use, accommodation, personal relationship, living environment and recreational space. In exception, financial situation satisfaction (FSS) is insignificant. It might be that the effect of FSS is picked up by the overall life satisfaction due to their high correlation ( $r=.61$ ,  $p<0.05$ ). Out of the other significant life domains, job and time-use satisfaction have by far the largest-magnitude coefficients among those for variables measured on the same scale. Moreover, we tested the relationship between the life domains and CTS for all European countries separately and found that these two life domains were significant in all the countries, further pointing to their importance.

Overall life satisfaction is also positively significant to CTS. It suggests that one unit increase in satisfaction with overall life leads to a 0.0139 increase in the log-ordered scale of CTS. Our finding is in line with past studies (Friman et al., 2017; De Vos et al., 2019).

### 4.2 CTS and other less frequently studied covariates

Furthermore, most of the employment variables also have a significant effect on CTS. Part-time workers are happier with their CTS compared to full-time workers. This might be because full-time workers tend to have longer commute times compared to part-time workers. Schwanen and Dijst (2002) came to similar conclusions, suggesting full-time workers have a lower commute/work and commute time ratio than part-time workers, thus indicating longer commute time for full-time workers (for an overview on travel-time ratio, see (Dijst & Vidakovic, 2000)). They also found that part-time workers tend to live closer to their workplace, whereas full-time workers live relatively far. It could also mean that for part-time workers, one of the two daily commute trips is likely to be during off-peak hours. For all these reasons, it seems logical that part-time workers would not only spend less time commuting but would also have less burdensome commutes than full-time workers.

Likewise, our model indicates that temporary employees are less likely to be satisfied with their commuting time than permanent employees. It could exist because people who do not have a permanent job might always live under the pressure of finding another job, followed by a need to develop an-



other commuting pattern. Other studies obtained similar results (Bruno et al., 2013; Graaf-Zijl, 2005; Waaijer et al., 2016). Moreover, we found that employees who did not experience any change in their employment status are happier with their commuting time than those who experienced a change. This might be because people who experienced a change in their employment status need to adjust and get used to the new situation in which they have to commute now thereby rendering them to be less satisfied with their commute time. Gardner (2009) obtained a similar conclusion and labelled commuting as a “stable” travel activity where commuters have a defined travel pattern.

Other uncommon variables are feelings and trust. Results indicate that when negative feelings increase with one unit, then also the log-odds of CTS decreases. Therefore, people who have more negative feelings are less satisfied with their commuting time. These results corroborate the findings from other studies (Bergstad et al., 2011; Morris & Guerra, 2015; Stutzer & Frey, 2004). The relationship between positive feelings and CTS is insignificant in Model 1. It is because the effect of positive feelings is picked up by negative feelings due to their high correlation. On the other hand, trust is positively significant to CTS. From the past study, we understand that trust is a personality trait (Denters & Klok, 2010), suggesting people who have trust in their political and legal system are happier with their life in general, thereby having higher CTS.

Many other covariates, like gender, health, age, income and level of urbanization also obtain significant results. Females have higher satisfaction with commuting time than males. People with bad health are more likely to report higher CTS compared to the reference group (good health). Adults have high levels of CTS compared to young adults. This might indicate that people between 30 to 50 years already have a defined commuting pattern and are used to that lifestyle compared to their cohorts who have just entered the workforce or are about to leave the workforce. This was pointed out by Gardner (2009). Employee's income also has a positive effect on CTS, indicating as income increases by one unit, CTS increases by 0.801.

Moreover, respondents living in suburban areas are most satisfied with their commute time, followed by respondents living in urban and rural areas. This could indicate that suburban areas do not necessarily have issues of traffic congestion and unavailability of parking as seen in urban areas. However, when comparing urban and rural areas, the former offers better infrastructural facilities and better connectivity. These features of the built environment could indirectly help in making commuting less stressful and more satisfying. This finding corresponds with the findings of Ye and Titheridge (2017).

Lastly, to control for contextual differences, a dummy variable (HDI) was created. The association between HDI and CTS implies that respondents living in well-developed countries tend to be more satisfied with commuting time compared to those living in less-developed countries. Therefore, it makes sense to redo the ordered logistic regression for less-developed and well-developed countries separately.

**Table 1.** Results of the ordered logistic regression for commuting time satisfaction

Variable	Model 1 <i>All countries</i>	Model 2 <i>Less-developed countries</i>	Model 3 <i>Well-developed countries</i>
<b><i>Satisfaction with sub-domains of life</i></b>			
Financial satisfaction	0.0001	-0.009	0.008*
Accommodation satisfaction	0.039***	0.045***	0.028***
Job satisfaction	0.249***	0.328***	0.187***
Time use satisfaction	0.147***	0.142***	0.149***
Personal relationship satisfaction	0.092***	0.106***	0.076***
Recreational space satisfaction	0.009**	-0.009*	0.028***
Living environment satisfaction	0.091***	0.110***	0.082***
<b><i>Satisfaction with life</i></b>	<b>0.013***</b>	<b>0.011*</b>	<b>0.025***</b>
<b><i>Employment characteristics</i></b>			
Part-time workers (ref: Full-time workers)	0.119***	0.109***	0.108***
Change in employment status to employed (ref: No change)	-0.095***	-0.045	-0.145***
Temporary employee (ref: Permanent employee)	-0.104***	-0.081***	-0.125***
<b><i>Feelings</i></b>			
Negative feelings	-0.059***	-0.094***	-0.024**
Positive feelings	-0.007	-0.042***	0.044***
Trust	0.016***	-0.014***	0.044***
<b><i>Socioeconomic and demographic characteristics</i></b>			
Female (ref: Male)	0.178***	0.167***	0.175***
Education level tertiary or higher than tertiary (ref: Lower than tertiary)	-0.035***	0.070***	-0.126***
Bad Health (ref: Good health)	0.060***	0.097***	0.011
Income of employees	0.801*	-4.846***	0.62
Age of Young Adults (ref: Adults)	-0.144***	-0.204***	-0.106***
Age of Older Adults (ref: Adults)	0.001	-0.013	0.007
Marital status Single/ Separated/ Widowed/ Divorced (ref: Married)	0.018	0.0006	0.033**
Car ownership (ref: Have a car)	0.009	-0.025	0.083***
Suburban (ref: Urban)	0.074***	0.148***	0.011
Rural (ref: Urban)	-0.027**	0.028	-0.074***
<b><i>HDI – Less-developed countries (ref: Well-developed countries)</i></b>	<b>-0.237***</b>		
<b><i>Thresholds between categories of CTS</i></b>			
Threshold 1 (0 very unsatisfied)   1)	-0.559***	-0.579***	-0.144
Threshold 2 (1   2)	0.067	0.135*	0.414***
Threshold 3 (2   3)	0.821***	0.965***	1.099***
Threshold 4 (3   4)	1.466***	1.689***	1.669***
Threshold 5 (4   5)	1.996***	2.267***	2.152***
Threshold 6 (5   6)	2.849***	3.216***	2.910***
Threshold 7 (6   7)	3.413***	3.863***	3.394***

Variable	Model 1 <i>All countries</i>	Model 2 <i>Less-developed countries</i>	Model 3 <i>Well-developed countries</i>
Threshold 8 (7   8)	4.149***	4.662***	4.077***
Threshold 9 (8   9)	5.072***	5.700***	4.919***
Threshold 10 (9   10(very satisfied))	5.890***	6.595***	5.696***
n	117,041	55,494	61,547
Degrees of freedom	25	24	24
Log-Likelihood	-225,381	-107,830	-116,640
McFadden's Pseudo R <sup>2</sup>	0.0581	0.0694	0.0444
Likelihood-ratio test (Prob > chi2)	<0.0001	<0.0001	<0.0001

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

#### 4.3 Differences between less- and well-developed countries

There are considerable differences between the less-developed and well-developed countries. **Life satisfaction** is significant in both models, but it must be noted that for less-developed countries it is significant only at  $p < 0.100$  whereas for well-developed countries this is  $p < 0.001$ . The higher p-value for less-developed countries might indicate that the relationship between life satisfaction and CTS is not that straightforward (see commuting paradox theory (Stutzer & Frey, 2004)). In reality, there might be two groups of respondents: some people are satisfied with their life even if they endure an unsatisfactory commute (because it still allows them to reach a well-paid job for example), and other people are satisfied with their lives and therefore also tend to report higher levels of satisfaction with other life domains such as commuting time. These two groups balance each other out, which might eventually explain why the association between life satisfaction and CTS in Model 2 is much weaker and only exists at a higher p-value.

Amongst all the life domains, the most striking finding is that all **life domains** are positively significant in Model 3 unlike Model 2 where there is no significant influence of satisfaction with the financial situation on CTS and the recreation space satisfaction is negatively significant to CTS. This is difficult to explain and is open for further research. Nevertheless, it suggests that people from well-developed countries are generally happy with their life domains, which is why they also report a higher degree of CTS.

All **employment variables** are significant in well-developed countries, unlike less-developed countries. The significance in Model 3 and insignificance in Model 2 might be because the percentage of people who moved from unemployment to employment are more in well-developed countries than in less-developed countries. Furthermore, in Model 2, **positive feelings** have a negative association with CTS unlike Model 3. This might indicate that as the presence of positive feelings increases by one unit, the log-odds of CTS decreases. Likewise, **trust** also has a negative relationship with CTS in Model 2, and the opposite relation in Model 3. The negative relationship might suggest that respondents in less-developed countries who have higher trust in police, politics, and the legal system have lower levels of CTS. In general, we can conclude that feelings and trust have a significant effect on CTS, but whether positive or negative depends on the context of the country. Although the pseudo-R<sup>2</sup> explains Model 2 better than Model 3, we believe our contextual differences support the argument that people in wealthier countries are happier with all the life domains than lower-income countries

## 5 Conclusion

In this study, we performed an **ordered logistic regression** to identify associations between commuting time satisfaction (CTS) and satisfaction with multiple life domains, while also controlling for other covariates. We used a large **European dataset** to analyze the interactions between these variables and to understand how this is influenced by contextual differences across EU32 countries. In general, we found a positive association between CTS, life satisfaction and satisfaction with multiple **life domains**. Of all these life domains, job and time-use satisfaction have the strongest associations. For less-developed countries, two life domains are negatively associated with CTS: satisfaction with the financial situation (although not significant) and recreational space satisfaction (although significant at a higher p-value compared to well-developed countries). More research is needed to explain why these two life domains obtain different results for less- and well-developed countries.

We, however, do acknowledge the **limitations of this analysis**. One important shortcoming is that this European dataset does not include any information about commuting characteristics (distance, time and mode). Furthermore, for a robust evaluation of the relationship between employment characteristics and CTS, more predictors like the location of the residence and workplace, workplace attachment, workplace characteristics, and stress related to the job would be useful (Martin, 1999; Stroh, 1999).

In terms of **policy implications**, this study identifies two striking findings. First, even though life satisfaction has a positive effect on CTS in all models, this association is somewhat weaker for less-developed countries (given the higher p-value compared to well-developed countries). This suggests that CTS and life satisfaction do not always have a straightforward relationship (see commuting paradox theory for more explanation (Stutzer & Frey, 2004)). For some people, the two measures may be positively correlated, while others endure an unsatisfactory commute to reach a job that contributes to higher satisfaction with life and thus, has a negative correlation. Both groups can balance each other, eventually resulting in a weaker association between CTS and life satisfaction as we have observed for less-developed countries. Furthermore, in order to be satisfied with commuting time, it is not only important to be satisfied with life but also with other life domains, more specifically with the job and time-use life domains. This leads to our second important takeaway that job and time-use satisfaction are the two most important life domains that are strongly associated with CTS. We suggest this because we tested the relationship between the life domains and CTS for all European countries separately and found that these life domains were significant in all the countries. Additionally, these two variables have by far the largest-magnitude coefficients among those for variables measured on the same scale, further pointing to their importance. Policymakers and practitioners should thus be aware that being happy with commuting is not always about transport mode, distance and time. There are also other ways to improve commuting satisfaction, especially when you think about the interactions with other life domains. Instead of only paying attention to lowering commuting time because then people are more satisfied with their commuting (as has been found in other studies), policymakers should pay attention to making sure that people are first of all satisfied with their job (and other employment-related characteristics) and second of all satisfied with their general time use like how people organize their daily lives, the timing of activities such as work in relation to school/dropping off, picking up of children/grocery shopping/leisure time/etc. Time use satisfaction can be addressed well in the context of interactions between land-use and transport. Previous findings suggest an influence of the built environment on commuting satisfaction. Mouratidis et al. (2019) pointed out that compact and dense urban areas promote shorter trips and increase satisfaction with commuting. Ewing et al. (1994) and Schwanen (2002) indicated that higher built density leads to shorter commute time. The effects of land-use diversity can also be compared to the effects of dense and compact urban areas. Greater diversity encourages the use of active and public transport modes over motorized use (Cervero & Kockelman, 1997). High diversity areas are also

associated with lower trip chaining (Ewing et al., 1994). Thus, these findings suggest that policy makers should seek to develop neighborhoods with a better mix of uses and high-density development in order to have a population that is satisfied with their use of time.

This is important because from past studies we understand that each life domain is integrated with people's lives in a specific and connected way through travel and that satisfaction with each life domain and overall life satisfaction has an effect on travel and vice versa (Veenhoven, 2012; Zarabi et al., 2019). Thus, this study contributes to reporting other innovative ways to obtain high levels of commuting time satisfaction rather than only looking at the interactions with transport mode, travel distance and travel time.

There are also several **avenues for further research**. In this paper, we have analyzed only the direct effect of life satisfaction (among others) on CTS. However, the effect of life satisfaction on CTS can also be indirectly through domain-specific satisfactions. Such indirect effects can be estimated using Structural Equation Modelling (SEM). Furthermore, we tried to account for contextual differences across countries by distinguishing less-developed from well-developed countries. However, a more advanced analysis could be the use of a multilevel regression analysis that accounts for the nested data structure of respondents being clustered in countries with different contexts. Finally, we only had cross-sectional data from 2013. Longitudinal data are needed to obtain better insights into the causality between CTS, life satisfaction and satisfaction with life domains. Only with longitudinal data, we will be able to analyze if changes in life satisfaction result in changes in CTS and if this effect is mediated by domain-specific satisfaction.

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