# Leisure Nothing for Commuters?

The Effect of Commuting Time on Labour Supply


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*“The problem with putting two and two together is that sometimes you get four, and sometimes you get twenty-two.”*

— Dashiell Hammett (Jevons, 2014, p.57)

**Abstract**

This thesis investigates the effect of commuting time on labour supply using US household survey data. To circumvent biased estimates as working hours and commuting time are jointly determined by the worker, a first differences approach is carried out, in which changes in the commute are assumed to be exogenous. The estimates suggest that there is no causal effect on labour supply that can be derived from commuting time. When investigating the impact of commuting on the partner's labour supply, women respond positively to their male partners' increased commute while male workers are unaffected to changes in their female partners' commuting patterns.

**Keywords:** commuting, labour supply, working hours, partner's labour supply

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## 1 Introduction

Modern infrastructure has made daily commuting to work a common and often necessary occurrence. The ability to commute has led to increased possibilities regarding both workplace opportunities as well as preferred location of residence. Commuting is time consuming and according to Stutzer and Frey (2008) it generates stress and monetary costs and affects the relationship between work and family life. Commuting also implicates social costs, such as environmental pollution and congestion (Stutzer & Frey, 2008).

The monetary costs of commuting are often substantial. For an average household in the United States, costs related to car driving is about twenty percent of the income and is thus higher than food expenditures (Stutzer & Frey, 2008). The commuter also pays in terms of valuable time that can seldom be used as fully productive worktime or be perceived as pure leisure.

Regarding health there is a range of bad outcomes associated with commuting. Stutzer and Frey (2008) list among disorders higher blood pressure, anxiety, less tolerance towards frustration, and negative effects on cognitive performance. Künn-Nelen (2016) finds that subjective health is substantially lower for individuals with longer commuting distances. Investigating daily feelings of US workers, Gimenez-Nadal and Molina (2019) find that spending more time commuting is in addition to increased stress during the commute also associated with a higher extent of sadness and fatigue during child care activities, implying a greater importance of consequences when considering a longer commute. Further, several papers find a positive relationship between commuting length and work absenteeism (e.g. see van Ommeren & Gutiérrez-i-Puigarnau, 2011; Künn-Nelen, 2016; Goerke & Lorenz, 2017; Gimenez-Nadal, Molina & Velilla, 2018) making the negative effects of commuting not only of importance for the health and well-being of the commuting individuals themselves but also affecting employers by decreasing worker productivity.

Unless commuters are self-destructive, one would expect individuals to choose workplace and place of residence so that utility is maximized. Thus, it would seem reasonable that individuals who experience commuting as strongly inconvenient move residence or take on another job although this could result in lower income. Otherwise the increased income that commuting in general provides (e.g. see Timothy & Wheaton, 2001; Reichelt & Haas, 2015) would outweigh

the inconveniences, making commuters report at least as good well-being as average[1]. However, commuters might not foresee the burden of the commute and end up in a commuting-trap that they cannot escape and thus cause unpredicted costs for themselves and society (Stutzer & Frey, 2008; Comerford, 2011).

The stated findings describe a gloomy picture of commuting. Thus, to entangle the effect of commuting on labour supply becomes a question of importance for policy decision making regarding infrastructure projects and urban planning as well as for commuting taxes or subsidies.

This thesis investigates whether or not commuters compensate themselves for lost free time due to commuting by decreasing their weekly labour supply. In addition to this, the effect of commuting on the partner's labour supply is studied to disentangle the effect of commuting on family labour supply. To account for potential reverse causation, as workplace and location of residence is jointly determined by the worker, a first differences approach is used in which place of residence, employer and occupation are held fixed. Accordingly, individuals who switch workplace or move place of residence in order to commute less and enjoy more leisure are excluded from the analysis, why changes in commuting time is assumed to be exogenously determined.

Theoretical models predict different effects of commuting costs on labour supply (Gutiérrez-i-Puigarnau & van Ommeren, 2009; Gimenez-Nadal & Molina, 2011; Black, Kolesnikova & Taylor, 2014). Trying to sort out the effect of commuting on labour supply is thus left to be an empirical matter. Previous research finds some positive effect on working hours explained by commuting in Germany (Gutiérrez-i-Puigarnau & van Ommeren, 2010), in the United Kingdom (Gutiérrez-i-Puigarnau & van Ommeren, 2015) and in the Netherlands (Gimenez-Nadal & Molina, 2014). For family labour supply in Germany, Carta and De Phillippis (2018) find that increasing the husband's commuting distance reduces the labour supply probability of his spouse while increasing his own working hours.

This study contributes to the existing literature by investigating commuting time and labour supply in the United States using household survey data from the Panel Study of Income Dynamics (PSID) between the years 2011 and 2017. The estimates suggest that there is no

[1] According to Manning (2003), wages do not fully compensate for longer commuting due to monopsony in modern labour markets.

causal effect on labour supply that can be derived from commuting time. When investigating the impact of commuting time on the partner's labour supply, women respond positively to increases in their male partners' commuting time. Increasing commuting time for men increases both weekly working hours for their partners as well as the probability for their partners to enter the labour market. Male workers are on the other hand unaffected to changes in their female partners' commute.

Contradicting both theoretical predictions as well as previous empirical findings the conclusion is that there is no universal way in how individuals adjust their labour supply to changes in commuting time. Political solutions to channel efficient labour markets should thus be based on local investigations, implying the importance for further research in the matter.

The paper proceeds as follows; next section presents theoretical predictions regarding commuting costs and labour supply together with previous empirical findings. Section three describes the methodology and data that is being used for the study. In section four the results are presented, followed by a discussion of these in section five. The last section concludes.

## 2 Theoretical Predictions and Earlier Empirical Findings

Manning (2003) argues that commuting is to a large extent wasteful, as it arises from frictions in the labour market. If this is the case, these frictions have severe consequences as commuters experience lower well-being, worsened physical health (Stutzer & Frey, 2008; Künn-Nelen, 2016) and are more absent from work (van Ommeren & Gutiérrez-i-Puigarnau, 2011; Künn-Nelen, 2016; Goerke & Lorenz, 2017; Gimenez-Nadal, Molina & Velilla, 2018). Different theories diverge in their predictions of the effect of commuting costs on labour supply (Gutiérrez-i-Puigarnau & van Ommeren, 2009; Gutiérrez-i-Puigarnau & van Ommeren, 2010; Gimenez-Nadal & Molina, 2011). Regardless of theoretical point of departure, empirical evidence might contradict theoretical optimization problems as individuals might not foresee the burden of commuting costs and thus end up in a commuting-trap that they cannot escape (Stutzer & Frey, 2008; Comerford, 2011). How individuals behave in practice is thus left to be an empirical matter.

### *2.1 Theoretical Predictions*

There are divergent strands in force regarding models for optimal labour supply that account for commuting costs. Depending on what underlying assumptions one considers, commuting

costs are by some models predicted to decrease labour supply while other models allow for the opposite possibility (Gutiérrez-i-Puigarnau & van Ommeren, 2009; Gutiérrez-i-Puigarnau & van Ommeren, 2010; Gimenez-Nadal & Molina, 2011). Assuming a fixed number of workdays, labour supply models in general imply that daily as well as total labour supply decreases when commuting time increases, while an increase in monetary commuting costs will give the opposite effect (Gutiérrez-i-Puigarnau & van Ommeren, 2010).

In a theoretical model, in which individuals derive utility from income and leisure, and in which utility is maximized by choosing daily working hours and number of workdays, Gutiérrez-i-Puigarnau and van Ommeren (2009) show that commuting costs, both monetary and in the form of time, increase daily labour supply. As commuting time is shown to decrease the number of workdays, the total effect of commuting costs measured in units of time on labour supply is ambiguous. The total effect of increases in monetary costs associated with commuting is also ambiguous as it is unclear whether or not the income effect will dominate the substitution effect. Gutiérrez-i-Puigarnau and van Ommeren (2009) highlight that workers are likely to respond differently to increases in monetary commuting costs compared to decreases in wages.

Black, Kolesnikova and Taylor (2014) extend the theoretical literature by in addition to present a static one-person model also invent a model in which two individuals together maximize the utility for the couple. They conclude that their theoretical results are the same for both models; increased commuting costs do not increase labour supply, but labour supply might be decreased. Thus, if both commuting costs and labour supply for an individual increase, the partner's labour supply must have to decrease as a response (Black, Kolesnikova & Taylor, 2014).

### *2.2 Earlier Findings for Commuting and Labour Supply*

Gutiérrez-i-Puigarnau and van Ommeren (2010) study the effect of exogenous changes in commuting distance on labour supply using German panel data. They find that commuting distance slightly increases daily and weekly labour supply, the results being somewhat more pronounced for women. In a later study, Gutiérrez-i-Puigarnau and van Ommeren (2015) replicate their earlier study using survey data for workers in the United Kingdom. Instead of measuring commuting in geographical distance, the authors measure commuting in units of time with the argument that if it is time rather than monetary costs associated with commuting that affects labour supply, then using distance may underestimate the results. The authors find no effect on labour supply among men from increases in commuting time, suggesting that men simply bear the costs of increased commuting time or enjoys the benefits from decreased

commuting time. Women on the other hand increase the number of working hours when commuting minutes increase (Gutiérrez-i-Puigarnau & van Ommeren, 2015).

Gimenez-Nadal and Molina (2011) look for a causal effect of commuting time on labour supply for workers in Spain. The authors deal with endogeneity by applying GMM/IV models in which housing prices are used as an instrument, assuming that decisions regarding location of residence are determined by housing prices. The results suggest that increasing daily commuting time by one hour is associated with increases in daily labour supply by 35 minutes.

Gimenez-Nadal and Molina (2014) examine whether or not labour supply is affected by commuting time in the Netherlands. For this they use propensity score matching to deal with endogeneity. With their model that allows for a nonlinear relationship between commuting time and working hours, they find that working hours are maximized when individuals have a daily commute of 3,22 hours.

To study the causal effect of commuting on labour supply, Gershenson (2013) uses a natural experiment in which substitute teachers are subject to exogenous variation in commuting time and are free to accept or reject job offers on a daily basis. The results show a negative elasticity between commuting and labour supply among the studied US substitute teachers with no statistical difference in the results between men and women. Gershenson thus proposes that the stylized fact about women having shorter commutes than men is driven by endogenous decisions of household-locations.

Investigating US cross-city differences in commuting time to explain the large variation in married women's labour supply, Black, Kolesnikova and Taylor (2014) find that labour force participation is negatively associated with the metropolitan area commuting time. The authors' empirical results thus confirm their theoretical predictions about commuting costs reducing labour supply. However, whether or not their theory about labour supply never increasing with commuting costs holds when seeing a couple as one utility maximizing unit is unclear as the husband's labour supply is not empirically explored.

Following Gutiérrez-i-Puigarnau and van Ommeren's (2010, 2015) research approach in which changes in commuting patterns are assumed to be exogenously determined to the worker, Carta and De Phillippis (2018) study family labour supply in Germany. Their findings suggest that increasing the husband's commuting distance reduces the labour supply probability of his

spouse while increasing his own working hours. For couples with children and highly educated husbands the effect is stronger, and the authors conclude that the specialization of labour within couples increases with the husband's commute.

In summary, theoretical predictions for the effect of commuting costs on labour supply is not clear-cut. Empirical investigations also differ in their findings, making the effect of commuting costs on labour supply ambiguous. This thesis contributes to the existing literature by re-examining the effect of commuting time on labour supply. In doing so, to the best of my knowledge, this study uses the most recent sample among papers investigating the effect of commuting on labour supply.

## 3 Empirical Specification

Whether commuting time has any effect on labour supply is econometrically tested using regression analysis. As workplace and location of residence are jointly determined by the worker, the observable time variables, i.e. weekly working hours and daily commuting minutes, are the endogenous equilibrium outcomes. In order to estimate the effect of commuting time on labour supply a first differences approach in the spirit of Gutiérrez-i-Puigarnau and van Ommeren (2009, 2010, 2015) is conducted. More specific, panel data for individuals who keep the same employer, occupation and location of residence in two sequential observation events are analysed. With this setup changes in commuting time are assumed to be exogenously determined to the worker, either by firm relocations or by changes in travel speed.

### *3.1 Econometric model*

To empirically look for an effect of commuting time on labour supply the following regression equation is first composed;

$$WH_{it} = \beta_0 + \beta_1 com_{it} + \beta_2 X_{it} + \varepsilon_i + u_{it} \quad (1)$$

in which working hours, *WH*, of individual *i* in time *t* is explained by the commuting time in minutes, *com*, of that individual. $\beta_1$ shows the explanatory power for the correlation of commuting time and working hours. *X* is a vector of time-varying controls for individual and family characteristics and $u_{it}$ denotes an overall error term. $\varepsilon_i$ denotes unobserved time-invariant worker characteristics. Given that workplace and residence are jointly determined by

the worker, $\varepsilon_i$ may include unobserved worker specific preferences for leisure, where to live and what to do for a living (Gutiérrez-i-Puigarnau & van Ommeren, 2009). Thus, taking first differences of *Equation 1* yields the following estimation model, regressed with ordinary least squares, in which unobserved individual-specific heterogeneity is cancelled out;

$$WH_{it} - WH_{it-1} = \beta_1[com_{it} - com_{it-1}] + \beta_2[X_{it} - X_{it-1}] + u_{it} - u_{it-1} \quad (2)$$

and the difference in working hours for individual *i* in period *t* and period *t-1* is now explained by the change in commuting time between the same two time periods. The first differences approach removes unobserved heterogeneity, i.e. variation across individuals, as it removes time independent factors. The estimation coefficient $\beta_1$ now captures the effect of commuting time on labour supply. For the equation to generate consistent estimates of $\beta_1$, the change in commuting time must not be related to the error term, $u_{it} - u_{it-1}$. With the setup that is restricting commuting time to only vary with factors that are out of the worker's control, reverse causation is eliminated (Gutiérrez-i-Puigarnau & van Ommeren, 2009). The outcome from estimating *Equation 2* is thus assumed to show the direct effect of commuting time on labour supply.

When investigating the effect of commuting time on the partner's labour supply the same estimation model as in *Equation 2* is used but working hours as the dependent variable is substituted to be the partner's working hours. Also, the set of time-varying controls are updated to control for characteristics that could affect the partner's labour supply.

To further explore the partner's labour participation on the extensive margin from changes in the respondent's commute, the dependent variable is created as a dummy variable, taking the value of one if the partner is working and zero otherwise. Taking first differences of this dummy variable yields three different outcomes being one, minus one or zero as individuals either enter or exit the labour force or keep their labour status constant. After manipulating the dependent variable to investigate the extensive margin, *Equation 2* is regressed using ordered logit estimation to get the marginal effect of changes in commuting time on the partner's labour status.

Gutiérrez-i-Puigarnau and van Ommeren (2015) list two possible reasons that could explain an exogenous change in the worker's commute when holding employer, occupation and residence fixed. The first explanation for changes in commuting time is an employer-induced workplace

relocation, inducing an exogenous change in the worker's commute. Another possible scenario is that commuting time has changed because of changes in travel speed. This could be due to increased congestion or a result from infrastructure inventions and thus be exogenous to the worker.

Problems arise when changes in commuting time are caused by factors within the workers' control. A change in commuting time could be the result of an endogenous change in travel speed when workers change their means of transportation (Gutiérrez-i-Puigarnau & van Ommeren, 2015). Another problem that could violate the assumption about changes in the commute being exogenous to the worker is the risk of endogeneity due to measurement errors. As small changes in commuting time are likely to be a mere result from measurement errors due to inaccurate reporting by the worker (Gutiérrez-i-Puigarnau & van Ommeren, 2015), observations with changes in commuting time of less than five minutes are excluded to reduce the risk of endogeneity.

### *3.2 Data*

For this study data is collected from the Panel Study of Income Dynamics (PSID)[2]. Conducted by the University of Michigan, the PSID stores ongoing longitudinal US household survey data from every second year. The PSID includes information of socio-demographics, employment, health and wealth for the respondent and, if present, his or her spouse. As information about commuting time was first introduced into the survey in 2011, data are used from this wave up until the for now most recent available wave in 2017. This results in four sequential observation events from which first difference variables spanning over two years are created.

The PSID survey is carried out so that the respondent is reporting answers to questions regarding the respondent himself as well as for the other members in the family unit. When studying survey data, one always runs the risk that the respondent has reported inaccurate answers with the consequence that incorrect values are used for the analysis. When the respondent reports information about the spouse's number of working hours, commuting minutes and the like, the risk of imprecise values increases further. Accordingly, interpretation of the results should be done with care, taking into consideration that the data may include some extent of measurement errors.

[2] For additional information about the PSID go to https://psidonline.isr.umich.edu.

### *3.3 Sample Selection and Descriptive Statistics*

To carry out the analysis, the selected sample includes only those individuals who keep employer, occupation and location of residence constant between two consecutive observation events. For this, individuals who report that they moved in to their current street address the same year as the previous date of observation took place and up to the year of the following observation event are removed from the selected sample. Consequently, the individuals that the analysis is based upon hold their place of residence constant between the events of observation. For example, the selected individuals who report their weekly working hours and daily commute in 2015 and 2017, have not moved their street address after the year of 2014 or before the year of 2018.

The selected individuals are all currently working for their employer at the time of observation. The year of which the individuals started working for this employer is also given in the data. To keep employer fixed, individuals who report a later start date for his or her current employment than the year foregoing the previous observation event are excluded. Thus, a change in commuting time should be caused by employer induced firm-relocations or a change of speed in travel time.

An important aspect to consider is a change of position within the firm. This aspect is of particular importance as the promotion itself could explain changes in labour supply as well as cause changes in commuting time if the new position has another location. To avoid this, only individuals who do not change occupation are used for the analysis. In the data, the individuals most important activities and duties are sorted into standard occupational classification (SOC) codes issued by the Census Bureau at the U.S. Department of Commerce. By only including individuals with their SOC codes kept constant, these individuals are assumed to not have been promoted within the firm and consequently the attractiveness of the job is assumed to be held constant.

In addition to keeping employer, occupation and location of residence constant, I restrict the analysis to individuals who do not change their family composition other than changes in children entering or exiting the household. Thus, individuals for which a partner move in or out of the family unit, or for which a partner exits the family unit due to death, are excluded. This is done because these kind of changes in family composition are likely to affect the economic conditions of the household and thus affect choices regarding labour supply. Also, individuals

that report more than one job are excluded as changes in daily commute for individuals with additional jobs are likely to be endogenously determined.

Gutiérrez-i-Puigarnau and van Ommeren (2010) focus on individuals working between two hours a day and maximally hundred hours per week. In accordance with this approach I exclude all data for individuals working less than ten hours and more than a hundred hours every week as these are considered to be outliers. One might reasonably argue that a sample allowing for working hours to reach hundred hours still consists of outliers. However, OECD (2020) estimates that eleven percent of US workers work more than fifty hours per week. By restricting the sample to hundred hours per week the percent of individuals reporting their weekly working hours to exceed fifty hours are in line with the OECD estimates for the US population. Further, the sample is restricted to only include individuals aged 22 to 62 years old, an age range where young adults are likely to have entered the job market, and older workers are approaching retirement age.

Inspired by Gutiérrez-i-Puigarnau and van Ommeren (2015) I control for the employment being covered by a union contract and the number of children under the age of 18 in the family unit. Controlling for union contracts is plausible as this regulates working hours, wages and parental leave. Children, especially those entering the family unit, are likely to affect labour supply patterns for their parents as extra time for childcare is needed but also as extra expenditures have to be covered.

Gutiérrez-i-Puigarnau and van Ommeren (2015) account for possible endogenous changes by controlling for mode of transport as well as carrying out an analysis for a subsample of individuals that does not change their travel mode. With the chosen data set I cannot control for the mode of transport, which might bias the results. As a second-best attempt to handle potential endogeneity in the commuting time variable, I control for changes in the number of vehicles in the family unit.

In addition, I control for received inheritance and gifts and self-rated health status. Unless on beforehand expected, receiving a large inheritance or gift works as an exogenous shock in wealth that could affect labour supply[3]. The control variable for whether the family unit has

[3] Cesarini et al. (2017) find changes in labour supply explained by exogenous monetary shocks from winning the lottery. Controlling for winning the lottery would be ideal, however, the chosen data sample does not allow for this.

received any inheritance or gift in the last two years of 10.000 dollars or more is constructed as a dummy variable, taking the value of one if a gift or inheritance was received and zero otherwise. Unlike the other variables, this control is not manipulated into first-differences. If a monetary shock was received both in the previous time period and then again in the next time period, taking first differences would cancel out any effect. However, individuals are likely to evaluate their desired labour supply after each additional monetary shock.

Health is another variable that could affect labour supply. The worker might have to involuntarily decrease labour supply due to worsened health issues or might increase labour supply as health status improves.

Further, several papers point out the difference of commuting patterns between the sexes (e.g. see McQuaid & Chen, 2012; Gutiérrez-i-Puigarnau & van Ommeren, 2010; Gutiérrez-i-Puigarnau & van Ommeren 2015; Tilley & Houston, 2016). Taking this into consideration, the analysis is carried out for men and women separately.

After selecting individuals with the described requirements, 9.4 percent of the observations from the original sample are left for the analysis. *Table 1* shows mean, standard deviation and number of observations for weekly working hours and commuting minutes in a day together with a range of sociodemographic characteristics for workers reporting a positive commute in two sequential observation events. The table shows on average a higher number of working hours and commuting minutes for men compared to women, although the longest daily commute observed is made by a female worker. Women hold a college degree to a slightly higher extent than men. About half of the sample have children that are under the age of 18 for both sexes. The vast majority have a motorized vehicle in the household.

**TABLE 1:** SUMMARY STATISTICS

| | *Men* | | | | *Women* | | | | *Total* | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Mean | S.D. | Min | Max | Mean | S.D. | Min | Max | Mean | S.D. | Min | Max |
| **Time use variables** | | | | | | | | | | | | |
| Working hours | 44.86 | 9.00 | 10 | 100 | 39.58 | 8.68 | 10 | 100 | 41.95 | 9.19 | 10 | 100 |
| Minutes commuting | 44.05 | 34.82 | 1 | 240 | 39.04 | 31.25 | 1 | 360 | 41.29 | 32.99 | 1 | 360 |
| **Socio-demographics** | | | | | | | | | | | | |
| Age | 45.05 | 9.66 | 22 | 62 | 45.21 | 9.58 | 23 | 62 | 45.13 | 9.61 | 22 | 62 |
| College degree | 0.41 | 0.49 | 0 | 1 | 0.48 | 0.50 | 0 | 1 | 0.45 | 0.50 | 0 | 1 |
| Living in a couple | 0.86 | 0.35 | 0 | 1 | 0.73 | 0.44 | 0 | 1 | 0.79 | 0.41 | 0 | 1 |
| Employed partner | 0.64 | 0.48 | 0 | 1 | 0.71 | 0.45 | 0 | 1 | 0.68 | 0.47 | 0 | 1 |
| Children<18 | 0.52 | 0.50 | 0 | 1 | 0.49 | 0.50 | 0 | 1 | 0.50 | 0.50 | 0 | 1 |
| #of children <18 | 1.02 | 1.22 | 0 | 7 | 0.90 | 1.10 | 0 | 7 | 0.95 | 1.16 | 0 | 7 |
| Vehicle in household | 0.96 | 0.21 | 0 | 1 | 0.96 | 0.20 | 0 | 1 | 0.96 | 0.20 | 0 | 1 |
| #of vehicles in household | 2.25 | 1.11 | 0 | 10 | 2.89 | 2.17 | 0 | 10 | 2.21 | 1.13 | 0 | 10 |
| Union contract | 0.17 | 0.38 | 0 | 1 | 0.19 | 0.40 | 0 | 1 | 0.18 | 0.39 | 0 | 1 |
| Observations | 2 352 | | | | 2 894 | | | | 5 246 | | | |

**Note:** The table shows summary statistics of US workers that are observed with a positive commute in two sequential observation events between the years 2011 and 2017 and do not change place of residence, employer, occupation or family composition in the period between observations other than children entering or exiting the family unit.

*Table 2* presents summary statistics for first differences of the time use variables. Concerning changes in weekly working hours the mean is larger for women. For changes in commuting time, the mean is negative for men and positive but somewhat weaker for women. Although the maximum change in commuting time is considerably larger among women and thus could be argued to drive the result of the opposite sign, the standard deviation is still lower compared to the one for men. *Table 2* also reports the number of observations for the first difference variables together with the number of individuals for which the observations are built upon. For example, if an individual reports fixed employer, occupation and location of residence in three sequential observation events this individual will appear twice in the data. On average each individual thus appears 1.31 times in the data material.

**TABLE 2:** SUMMARY STATISTICS FIRST DIFFERENCES FOR THE TIME USE VARIABLES

| | *Δ Working hours* | | | | *Δ Commuting time* | | | | Observations |
|---|---|---|---|---|---|---|---|---|---|
| | **Mean** | **S.D.** | **Min** | **Max** | **Mean** | **S.D.** | **Min** | **Max** | (Individuals) |
| **Men** | 0.05 | 6.83 | -50 | 50 | -0.39 | 25.24 | -297 | 195 | 1 617 (1 026) |
| **Women** | 0.26 | 6.96 | -48 | 63 | 0.29 | 23.31 | -273 | 330 | 2 262 (2 145) |
| **Total** | 0.17 | 6.91 | -50 | 63 | 0.01 | 24.13 | -297 | 330 | 4 164 (3 171) |

**Note:** The table shows summary statistics for changes in weekly working hours and daily commuting measured in number of minutes to and from work. A change in commuting time of less than five minutes is excluded to avoid measurement errors.

*Table 3* shows correlations of commuting time and working hours as well as the correlations of these variables in the form of first differences. The correlation of the variables shows a positive statistically significant result for women, suggesting that the number of weekly working hours among women increases with commuting time. For men the correlation is negative but weaker in impact and statistically insignificant, giving cold support for any connection between the two variables.

When manipulating the data into first differences, the correlation between the variables is negative for women and the statistical significance is lost. Also for men, the sign of the coefficient switches when studying the correlation for the first difference variables, implying a positive relationship between changes in commuting time and working hours. The correlations are graphically illustrated in *Figure 1* and in *Figure 2*.

**TABLE 3:** CORRELATIONS OF WORKING HOURS AND COMMUTING TIME

| | *Commuting time and working hours* | | *First differences of commuting time and working hours* | |
|---|---|---|---|---|
| | **Correlation** | **Observations** | **Correlation** | **Observations** |
| **Men** | -0.020 | 2 352 | 0.016 | 1 617 |
| **Women** | 0.065*** | 2 894 | -0.006 | 2 262 |
| **Total** | 0.044*** | 5 246 | 0.004 | 4 164 |

**Note:** Pearson correlations of weekly working hours and daily commuting minutes. *, **, *** show statistical significance of 10, 5 and 1 percent respectively. A change in commuting time of less than five minutes is excluded to avoid measurement errors.

*Figure 1* illustrates the correlation between weekly working hours and minutes spent commuting to and from work in a day. The scatter plot shows that women on average work shorter hours compared to men. However, while women seem to increase their labour supply with the time they spend on commuting, the case for men tend to be the opposite. Regardless of the direction of which the correlation slopes, the relationship between commuting time and working hours is steeper for women, suggesting that commuting time plays a bigger impact in female labour supply.

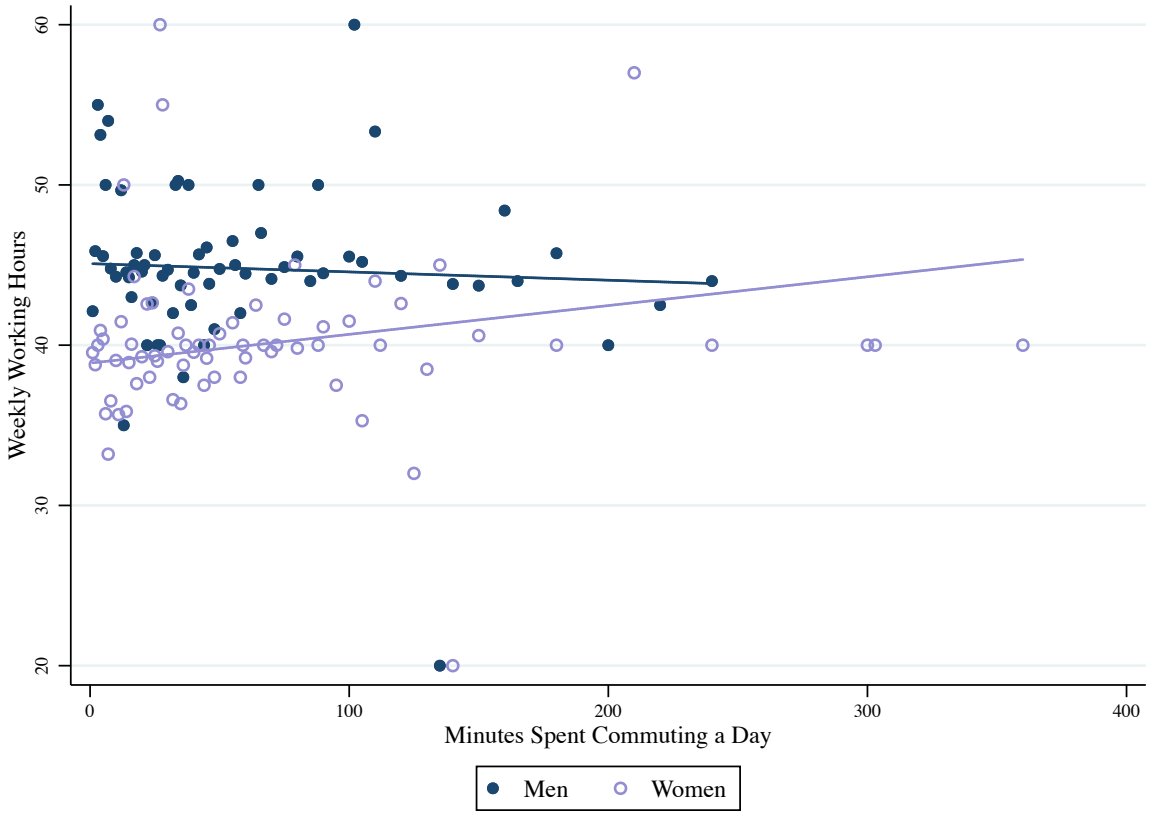


**FIGURE 1:** WEEKLY WORKING HOURS AND COMMUTING TIME IN MINUTES PER DAY
**Note:** Data binned into 100 percentiles.

*Figure 2* illustrates the correlation between changes in weekly working hours and changes in minutes spent commuting to and from work in a day. For women a positive change in commuting minutes is associated with a negative change in labour supply. For men the positive correlation is visible in the figure.

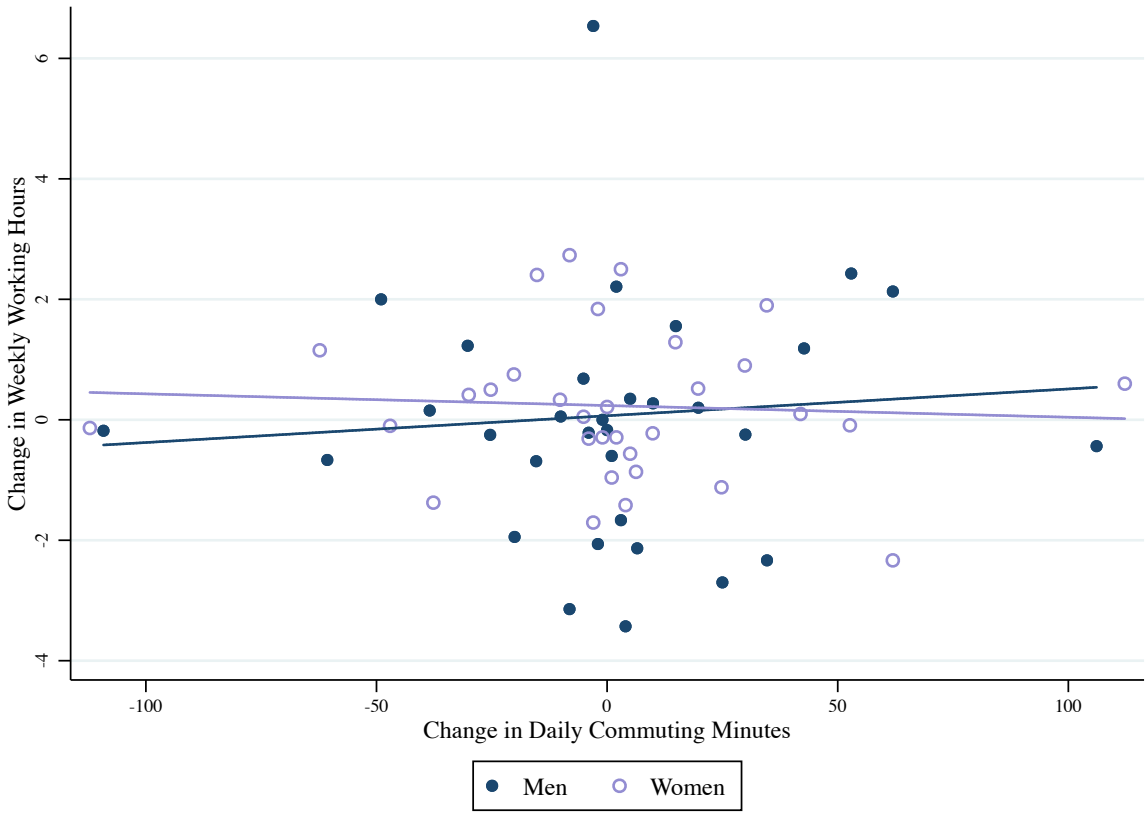


**FIGURE 2:** CHANGES IN WEEKLY WORKING HOURS AND IN DAILY MINUTES COMMUTING
**Note:** Data binned into 100 percentiles.

## 4 Estimation Results

*Table 4* shows the regression results from the first difference estimates of commuting time and labour supply. The estimation coefficient suggests that an exogenous increase in daily commuting time has a positive effect on weekly working hours for men. Increasing daily commuting time by an hour is associated with an increase in weekly labour supply by about 15 minutes. For women, the estimation coefficient suggests that a daily hourly increase in commuting time is instead associated with decreasing weekly labour supply with the impact being half of the one for men. However, independent of gender the estimates are statistically insignificant, implying that for the investigated sample no effect on labour supply can be derived from changes in commuting time.

**TABLE 4:** ESTIMATES OF CHANGE IN COMMUTE AND LABOUR SUPPLY

| | *Men* | | *Women* | | *Total* | |
|---|---|---|---|---|---|---|
| | [1] | [2] | [3] | [4] | [5] | [6] |
| Commuting time | 0.004 | 0.004 | -0.002 | -0.002 | 0.001 | 0.001 |
| | (0.005) | (0.005) | (0.005) | (0.005) | (0.004) | (0.004) |
| # of children <18 in household | | -0.207 | | -0.275 | | -0.259 |
| | | (0.371) | | (0.318) | | (0.252) |
| Union contract | | -0.839 | | 1.849 | | 0.604 |
| | | (0.739) | | (1.182) | | (0.736) |
| # of vehicles in family unit | | 0.109 | | 0.201 | | 0.162 |
| | | (0.201) | | (0.164) | | (0.126) |
| Perceived health | | 0.037 | | -0.058 | | -0.015 |
| | | (0.234) | | (0.237) | | (0.166) |
| Inheritance/gift in family unit | | 1.534 | | 0.229 | | 0.734 |
| | | (1.077) | | (0.664) | | (0.576) |
| Year dummies | √ | √ | √ | √ | √ | √ |
| Observations | 1 617 | 1 617 | 2 262 | 2 262 | 3 879 | 3 879 |
| R-squared | 0.001 | 0.004 | 0.004 | 0.006 | 0.002 | 0.003 |

**Note:** First difference estimates of weekly hours worked and daily commuting time in minutes. A change in commuting time of less than five minutes is excluded to avoid measurement errors. Robust standard errors in parenthesis. *, **, *** show statistical significance of 10, 5 and 1 percent respectively.

*Table 5* shows the regression results from the first difference estimates of commuting time on the partner's labour supply on the extensive margin, i.e. whether the partner enters or exits the labour market as a response to changes in the respondent's commute. The estimates show that changes in commuting time do affect the partner's labour force participation among men. As the sample consists of no same-sex couples, this result suggests that women respond to changes in their male partners' commuting time. According to the estimates, increasing commuting time with an hour for a male worker increases the probability of his spouse to enter the labour market by 5.6 percent while the probability of exiting the labour market or keeping labour status constant decreases by 2.0 and 3.7 percent respectively. This result remains robust when controlling for time-varying characteristics. Changes in female workers' commuting time has, on the contrary, no effect on their male partners' labour status.

**TABLE 5:** CHANGE IN COMMUTE AND PARTNER'S LABOUR SUPPLY EXTENSIVE MARGIN

| | *Men* | | *Women* | | *Total* | |
|---|---|---|---|---|---|---|
| | [1] | [2] | [3] | [4] | [5] | [6] |
| **Entering the Labour Market** | | | | | | |
| Respondent's Commuting Time | 0.00094*** (0.00035) | 0.00094*** (.00035) | 0.00004 (0.00006) | 0.00004 (0.00006) | 0.00043** (0.00017) | 0.00043*** (0.00017) |
| Partner's perceived health | | -0.02589** (0.01290) | | -0.00033 (0.00271) | | -0.01131* (0.00600) |
| # of vehicles in family unit | | 0.01602 (0.01058) | | 0.00234 (0.00173) | | 0.01044** (0.00483) |
| # of children<18 in household | | -0.00839 (0.02020) | | 0.00450 (0.00382) | | -0.00020 (0.00984) |
| Inheritance/gift in family unit | | 0.02824 (0.04572) | | -0.00750** (0.00370) | | -0.00885 (0.01758) |
| **Exiting the Labour Market** | | | | | | |
| Respondent's Commuting Time | -0.00033*** (0.00012) | -0.00033*** (0.00012) | -0.00008 (0.00012) | -0.00008 (0.00012) | -0.00021** (0.00008) | -0.00021*** (0.00008) |
| Partner's perceived health | | 0.00910* (0.00466) | | 0.00064 (0.00532) | | 0.00540* (0.00289) |
| # of vehicles in family unit | | -0.00563 (0.00375) | | -0.00459 (0.00331) | | -0.00498** (0.00233) |
| # of children<18 in household | | 0.00295 (0.00709) | | -0.00882 (0.00729) | | 0.00009 (0.00469) |
| Inheritance/gift in family unit | | -0.00890 (0.01301) | | 0.02446 (0.01798) | | 0.00456 (0.00977) |
| **Unchanged Labour Status** | | | | | | |
| Respondent's Commuting Time | -0.00061*** (0.00023) | -0.00061*** (0.00023) | 0.00004 (0.00006) | 0.00004 (0.00006) | -0.00022** (0.00009) | -0.00023** (0.00009) |
| Partner's perceived health | | 0.01679** (0.00841) | | -0.00031 (0.00261) | | 0.00592* (0.00319) |
| # of vehicles in family unit | | -0.01039 (0.00691) | | 0.00225 (0.00175) | | -0.00546** (0.00259) |
| # of children<18 in household | | 0.00544 (0.01312) | | 0.00432 (0.00375) | | 0.00010 (0.00515) |
| Inheritance/gift in family unit | | -0.01934 (0.03276) | | -0.01695 (0.01467) | | 0.00429 (0.00783) |
| Observations | 1 382 | 1 376 | 1 718 | 1 715 | 3 100 | 3 091 |
| Pseudo R-squared | 0.0032 | 0.0069 | 0.0004 | 0.0067 | 0.0019 | 0.0046 |

**Note:** The table shows results from ordered logit-model estimates. The outcome variable is the change in labour supply status of the spouse. The explanatory variable is the change in commuting minutes. Changes in commuting time of less than five minutes are excluded to avoid measurement errors. Robust standard errors in parenthesis. *, **, *** show statistical significance of 10, 5 and 1 percent respectively.

*Table 6* shows the regression results from the first difference estimates of commuting time on the partner's total labour supply. Changes in men's commuting minutes seem to have a much bigger impact on their partners' labour supply compared to the effect on women's partners when women face changes in their commuting time. According to the estimates, increasing men's daily commuting time by an additional hour increases their female partners' weekly

labour supply by about 162 minutes. This result is somewhat weaker when controlling for time-varying characteristics both in terms of economic impact and statistical significance.

The estimates for partners of female workers are statistically insignificant and thus there seems to be no effect on male workers' labour supply that can be derived from changes in their spouses' commuting time. As in the case of the extensive margin estimates, this result is interpreted as women being more responsive to changes in their male partners' commuting time than men are to changes in their female partners' commuting patterns.

**TABLE 6:** ESTIMATES OF CHANGE IN COMMUTE AND PARTNER'S LABOUR SUPPLY

| | *Men* | | *Women* | | *Total* | |
|---|---|---|---|---|---|---|
| | [1] | [2] | [3] | [4] | [5] | [6] |
| **ΔRespondent's attributes** | | | | | | |
| Commuting time | 0.045*** | 0.041** | 0.006 | 0.004 | 0.027** | 0.024** |
| | (0.017) | (0.012) | (0.014) | (0.014) | (0.011) | (0.011) |
| **ΔPartner's attributes** | | | | | | |
| Perceived health | | -1.119* | | -0.297 | | -0.746* |
| | | (0.636) | | (0.463) | | (0.391) |
| Union contract | | 8.413*** | | 7.312*** | | 7.767*** |
| | | (3.156) | | (2.691) | | (2.093) |
| **ΔFamily unit characteristics** | | | | | | |
| # of vehicles in family unit | | 1.216** | | 0.120 | | 0.724** |
| | | (0.553) | | (0.329) | | (0.321) |
| # of children<18 in household | | -0.748 | | 0.151 | | -0.247 |
| | | (0.978) | | (0.617) | | (0.577) |
| Inheritance/gift in family unit | | 0.942 | | -0.132 | | 0.018 |
| | | (2.309) | | (1.315) | | (1.248) |
| Year dummies | √ | √ | √ | √ | √ | √ |
| Observations | 1 382 | 1 376 | 1 718 | 1 715 | 3 100 | 3 091 |
| R-squared | 0.145 | 0.156 | 0.000 | 0.011 | 0.075 | 0.084 |

**Note:** The table shows results from first difference estimates. The outcome variable is the change in weekly working hours of the spouse. Commuting time is measured in minutes. Changes in commuting time of less than five minutes are excluded to avoid measurement errors. Robust standard errors in parenthesis. *, **, *** show statistical significance of 10, 5 and 1 percent respectively.

Together with the results from *table 4,* the estimates suggest that an increase in men's commute increases his partner's labour supply but not his own. For women the estimates are constantly insignificant and no effect on labour supply can hence be derived from a change in her commuting time, neither for herself nor for her partner.

### *4.1 Sensitivity Analysis*

To check the robustness of the results, the estimates are carried out when large changes in commuting time are omitted. Thus, changes in commuting time are restricted to a maximum of 120 minutes per day. To further reduce the risk of measurement errors, changes in commuting time of less than ten minutes are excluded from the analysis. Accordingly, the data is reduced to 84 percent of the originally selected sample.

*Table 7* shows the regression results from the first difference estimates of commuting time and labour supply when restricting the sample to allow for changes in commuting time to take values between 10 and 120 minutes inclusive. For this restricted sample, the results are more pronounced for both men and women, both keeping their previous sign of the estimation coefficients. For men, increasing daily commuting time by an hour is now being associated with an increase in weekly labour supply by 22 minutes. For women the impact is now stronger compared to men, suggesting a decrease in weekly labour supply by 29 minutes when the daily commute increases by an hour. The estimates are however still statistically insignificant and thus the previous result of no effect on labour supply derived from changes in commuting time still applies for when large changes in commuting minutes are excluded.

**TABLE 7:** ESTIMATES OF CHANGE IN COMMUTE AND LABOUR SUPPLY

| | *Men* | | *Women* | | *Total* | |
|---|---|---|---|---|---|---|
| | [1] | [2] | [3] | [4] | [5] | [6] |
| Commuting time | 0.006 | 0.006 | -0.008 | -0.008 | -0.001 | -0.001 |
| | (0.007) | (0.007) | (0.007) | (0.007) | (0.005) | (0.005) |
| # of children <18 in household | | -0.137 | | -0.261 | | -0.235 |
| | | (0.436) | | (0.385) | | (0.289) |
| Union contract | | -0.859 | | 1.143 | | 0.295 |
| | | (0.945) | | (1.073) | | (0.730) |
| # of vehicles in family unit | | 0.121 | | 0.248 | | 0.189 |
| | | (0.234) | | (0.183) | | (0.144) |
| Perceived health | | 0.069 | | -0.175 | | -0.066 |
| | | (0.261) | | (0.268) | | (0.187) |
| Inheritance/gift in family unit | | 1.819 | | 0.409 | | 0.988 |
| | | (1.278) | | (0.767) | | (0.675) |
| Year dummies | √ | √ | √ | √ | √ | √ |
| Observations | 1 361 | 1 361 | 1 890 | 1 890 | 3 251 | 3 251 |
| R-squared | 0.001 | 0.004 | 0.006 | 0.008 | 0.001 | 0.003 |

**Note:** First difference estimates of weekly hours worked and daily commuting time in minutes. The change in commuting time is restricted to 10 and 120 minutes inclusive. Robust standard errors in parenthesis. *, **, *** show statistical significance of 10, 5 and 1 percent respectively.

*Table 8* shows the regression results from commuting time on the partner's labour supply on the extensive margin for the reduced sample. The previous estimates showing that changes in commuting time do affect the partner's labour force participation on the extensive margin among men but not among women still hold when larger changes in commuting minutes are excluded although statistical significance is somewhat weaker.

**TABLE 8:** CHANGE IN COMMUTE AND PARTNER'S LABOUR SUPPLY EXTENSIVE MARGIN

| | *Men* | | *Women* | | *Total* | |
|---|---|---|---|---|---|---|
| | [1] | [2] | [3] | [4] | [5] | [6] |
| **Entering the Labour Market** | | | | | | |
| Respondent's Commuting Time | 0.00089** (0.00040) | 0.00089** (0.00040) | 0.00007 (0.00010) | 0.00007 (0.00010) | 0.00052** (0.00023) | 0.00052** (0.00023) |
| Partner's perceived health | | -0.02360 (0.01464) | | 0.00022 (0.00270) | | -0.00908 (0.00653) |
| # of vehicles in family unit | | 0.01610 (0.01183) | | 0.00278 (0.00278) | | 0.01108** (0.00537) |
| # of children<18 in household | | -0.00569 (0.02371) | | -0.00472 (0.00488) | | 0.00002 (0.01121) |
| Inheritance/gift in family unit | | 0.02422 (0.04563) | | | | -0.00187 (0.01879) |
| **Exiting the Labour Market** | | | | | | |
| Respondent's Commuting Time | -0.00031** (0.00014) | -0.00031** (0.00014) | -0.00014 (0.00020) | -0.00014 (0.00021) | -0.00025** (0.00011) | -0.00025** (0.00011) |
| Partner's perceived health | | 0.00815 (0.00517) | | -0.00045 (0.00552) | | 0.00438 (0.00317) |
| # of vehicles in family unit | | -0.00556 (0.00411) | | -0.00568 (0.00398) | | -0.00535** (0.00261) |
| # of children<18 in household | | 0.00197 (0.00820) | | -0.00688 (0.00885) | | -0.000011 (0.00541) |
| Inheritance/gift in family unit | | -0.00761 (0.01315) | | 0.01272 (0.01663) | | 0.00092 (0.00935) |
| **Unchanged Labour Status** | | | | | | |
| Respondent's Commuting Time | -0.00058** (0.00027) | -0.00058** (0.00027) | 0.00007 (0.00010) | 0.00007 (0.00010) | -0.00027** (0.00013) | -0.00027** (0.00013) |
| Partner's perceived health | | 0.01544 (0.00961) | | 0.00023 (0.00282) | | 0.00470 (0.00342) |
| # of vehicles in family unit | | -0.01054 (0.00781) | | 0.00290 (0.00198) | | -0.00573** (0.00287) |
| # of children<18 in household | | 0.00372 (0.01552) | | 0.00351 (0.00460) | | -0.00001 (0.00580) |
| Inheritance/gift in family unit | | -0.01660 (0.03253) | | -0.00801 (0.01191) | | 0.00095 (0.00944) |
| Observations | 1 175 | 1 170 | 1 428 | 1 426 | 2 603 | 2 596 |
| Pseudo R-squared | 0.0029 | 0.0061 | 0.0007 | 0.0047 | 0.0022 | 0.0045 |

**Note:** The table shows results from ordered logit-model estimates. The outcome variable is the change in labour supply status of the spouse. The explanatory variable is the change in commuting minutes. The change in commuting time is restricted to 10 and 120 minutes inclusive. Robust standard errors in parenthesis. *, **, *** show statistical significance of 10, 5 and 1 percent respectively.

The impact of changes in men's commuting time on their spouses' labour status is about the same as for the full sample estimates and thus robust to the exclusion of larger changes in commuting minutes. Increasing commuting time with an hour for a male worker now increases the probability of his spouse to enter the labour market by 5.3 percent while the probability of exiting the labour market or keeping labour status constant decreases by 1.9 and 3.5 percent respectively.

*Table 9* shows the regression results from the first difference estimates of commuting time on the partner's total labour supply for the reduced sample. When analysing the reduced sample, the effect of men's commuting time on their female partners' labour supply is somewhat more pronounced, increasing the impact by additionally seven minutes compared to the previous estimates. Among women the effect of commuting shifts from a positive to a negative impact on their partners' labour supply. However, the effect among women remains statistically insignificant and thus no effect on men's labour supply derived from changes in their female partners' commuting time is found.

**TABLE 9:** ESTIMATES OF CHANGE IN COMMUTE AND PARTNER'S LABOUR SUPPLY

| | *Men* | | *Women* | | *Total* | |
|---|---|---|---|---|---|---|
| | [1] | [2] | [3] | [4] | [5] | [6] |
| **ΔRespondent's attributes** | | | | | | |
| Commuting time | 0.047** | 0.043** | -0.005 | -0.008 | 0.027* | 0.024* |
| | (0.020) | (0.019) | (0.019) | (0.019) | (0.014) | (0.014) |
| **ΔPartner's attributes** | | | | | | |
| Partner's perceived health | | -0.683 | | -0.082 | | -0.446 |
| | | (0.715) | | (0.484) | | (0.424) |
| Union contract | | 8.361** | | 7.321*** | | 7.690*** |
| | | (3.370) | | (2.807) | | (2.192) |
| **ΔFamily unit characteristics** | | | | | | |
| # of vehicles in family unit | | 1.139* | | 0.106 | | 0.709* |
| | | (0.612) | | (0.386) | | (0.363) |
| # of children<18 in household | | -0.798 | | -0.303 | | -0.394 |
| | | (1.101) | | (0.674) | | (0.643) |
| Inheritance/gift in family unit | | 1.478 | | 0.964 | | 0.873 |
| | | (2.302) | | (1.368) | | (1.304) |
| Year dummies | √ | √ | √ | √ | √ | √ |
| Observations | 1 175 | 1 170 | 1 428 | 1 426 | 2 603 | 2 596 |
| R-squared | 0.167 | 0.176 | 0.000 | 0.011 | 0.084 | 0.092 |

**Note:** The table shows results from first difference estimates. The outcome variable is the change in working hours of the partner. The change in commuting time is restricted to 10 and 120 minutes inclusive. Robust standard errors in parenthesis. *, **, *** show statistical significance of 10, 5 and 1 percent respectively.

The conclusion drawn from the regression results is that changes in commuting time have no clear effect on labour supply. Although the sign of the estimated parameter is pervadingly positive for men and negative for women the economic impact is small and, regardless of gender, the estimates are consistently statistically insignificant. Consequently, no effect on labour supply can be derived from increased commuting costs in units of time. Studying the effect of changes in commuting time on the partner's labour supply, the estimates suggest that women respond positively to their partners' commuting time while men do not adjust their labour supply to changes in their partners' commute.

## 5 Discussion

Empirical findings that subjective well-being is substantially lower for individuals with longer commuting time seems a bit contradictive to findings of a positive correlation (e.g. see Schwanen & Dijst, 2002; Gimenez-Nadal & Molina, 2014) between commuting time and working hours. As one would expect individuals to choose occupation and place of residence so that utility is maximized, it would seem reasonable that individuals who experience commuting as strongly inconvenient move residence or take on another job although this could result in lower income. Otherwise the increased income that commuting in general provides (e.g. see Timothy & Wheaton, 2001; Reichelt & Haas, 2015) should outweigh the inconveniences, making commuters report at least as good well-being as average.

For this commuting paradox Stutzer and Frey (2008) suggest that although commuting might be perceived as a burden for the affected individual, the partner might benefit and thus equalize the total household's utility. Another explanation can be transaction costs preventing individuals to adjust to economic shocks (Stutzer & Frey, 2008). If people do not foresee the commuting costs, they might end up in a commuting-trap they cannot escape (Stutzer & Frey, 2008). A commuting-trap, although not self-imposed, is also likely to be the case when studying the short-term effect from exogenous time changes in commutes.

Schwanen and Dijst (2002) argue that the time duration of an activity increases with the time it takes to reach that activity. A correlation between labour supply and commuting time is thus plausible, as a longer commute facilitates more attractive jobs with higher incentives for longer working hours. My estimates suggest that workers do not adjust their labour supply to changes

in commuting time. Instead they seem to simply bear the cost from increased commuting time or enjoy the extra free-time when travel time decreases. As the estimates are assumed to only show the effect of an exogenously determined change in the commute, i.e. the attractiveness of the job is assumed to be held constant between the events of observations, the absence of a positive effect on labour supply from increased commuting time is reasonable.

Another response to increased commuting time could be to decrease labour supply to compensate for lost leisure. However, as income is assumed to be held constant with the given set-up, an additional unit of free-time will still cost the worker the same amount of lost income as before, why the worker will not necessarily decrease working hours to compensate for lost leisure. The result of finding no effect on labour supply from commuting could also show support for workers not significantly contemplating about their work and leisure relation in the short run or simply they do not have the authority to adjust their labour supply. However, keeping *Figure 2* in mind, both increased and decreased commuting time is associated with both increased and decreased working hours. If there is an effect from changes in commuting time on working hours, but individuals react differently to exogenous shocks in commuting time then the effect will be cancelled out, showing insignificant results.

The result contrasts the findings by Gutiérrez-i-Puigarnau and van Ommeren (2010) for German workers that are exposed to commuting changes measured in distance. Their findings suggest that women are more responsive in their labour supply compared to men and that women increase labour supply with increased commuting time. When measuring changes in commute in units of time for UK workers, Gutiérrez-i-Puigarnau and van Ommeren (2015) still find that female labour supply responds positively with increased commutes while men are unaffected. My estimates stand in contrast to this as no significant effect is found. On the contrary, although statistically insignificant, my estimates for women show a pervadingly negative estimation coefficient for labour supply from increases in commuting time.

Also my estimates for the partner's labour supply contradict both theoretical predictions and earlier empirical findings. In their theoretical model, Black, Kolesnikova and Taylor (2014) show that both for single individual utility maximisers as well as for utility maximisation within couples, increases in commuting costs never increase total labour supply. My estimates show cold support for this as increasing male workers' commuting costs in units of time has a positive effect on his partner's labour supply, thus supporting the opposite of this theoretical view. As there is no negative effect from commuting on men's labour supply this would have to be

compensated by a negative change in labour supply when investigating their partners' labour supply responses in order for Black, Kolesnikova and Taylor's predictions to hold[4].

Likewise, the results contrast Carta and De Phillippis' (2018) empirical findings about family labour supply in which they state that the husband's commuting distance reduces a positive labour supply probability of his spouse while increasing his own working hours. For the probability of labour market participation for the partner of male workers my estimates imply the opposite effect.

Seeing couples as a utility maximizing unit, the result could be interpreted as while the male worker pays for his increased commute in units of lost leisure, the monetary costs that could be associated with a farther commute is covered by an increase in working hours of his spouse.

The estimation specification used in this thesis basically captures the local average treatment effect for individuals facing an exogenous change in commuting time, keeping job and residence constant. Assuming some frictions for changing job or residence, the estimates are likely to reflect the short-term effect on labour supply from changes in commuting time for the whole population (Gutiérrez-i-Puigarnau & van Ommeren, 2009). However, observations are few, giving room for biases.

Together with earlier findings, one can conclude that there is no clear-cut answer regarding how individuals react to changes in commuting costs measured in units of time or distance. Contradicting both theoretical predictions as well as earlier empirical findings, the results show that research regarding the effect of commuting costs on labour supply lacks external validity. To channel efficient labour markets through political actions should thus be based on local investigations.

## 6 Conclusion

Empirical findings show that subjective well-being is substantially lower for individuals with longer commutes (Stutzer & Frey, 2008; Künn-Nelen, 2016). In addition to the commuting costs carried by the worker, also the employer faces part of the burden from commuting costs

[4] One could of course argue that the positive sign is driven by single men. Table A1 in the Appendix shows regression results for commuting time and labour supply excluding individuals not living in a couple, concluding that this is not the case.

as workers with longer commutes are associated with higher work absenteeism (e.g. see van Ommeren & Gutiérrez-i-Puigarnau, 2011; Künn-Nelen, 2016; Goerke & Lorenz, 2017; Gimenez-Nadal, Molina & Velilla, 2018). The purpose of this thesis is thus to re-examine the effect of commuting time on labour supply for the commuting worker and for his or her spouse. Investigating this link is of political importance when trying to assist with adequate solutions to reduce labour market maladjustments.

To investigate the effect of commuting time on labour supply, US household survey data from the Panel Study of Income Dynamics between the years 2011 and 2017 is used. A first differences approach is employed to avoid biased estimates due to endogeneity as location of residence and workplace are assumed to be jointly determined by the worker. While there is no effect of commuting time on labour supply among the workers themselves, increasing commuting time for men seems to have a positive effect on their female partners' labour supply, contradicting both theoretical predictions as well as earlier empirical findings. Considering this, the conclusion becomes that there is no universal answer regarding how individuals react to changes in commuting time. Political solutions to channel efficient labour markets should thus be based on local investigations, implying the importance for further research in the matter.

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**Data Contribution**

Panel Study of Income Dynamics, public use dataset. Produced and distributed by the Institute for Social Research, University of Michigan, Ann Arbor, MI 2020.

## Appendix

**TABLE A1:** CHANGE IN COMMUTE AND LABOUR SUPPLY FOR COHABITING INDIVIDUALS

| | *Men* | | *Women* | | *Total* | |
|---|---|---|---|---|---|---|
| | [1] | [2] | [3] | [4] | [5] | [6] |
| Commuting time | 0.004 | 0.005 | -0.006 | -0.005 | -0.000 | -0.000 |
| | (0.007) | (0.007) | (0.005) | (0.005) | (0.004) | (0.004) |
| # of children <18 in household | | -0.289 | | -0.284 | | -0.292 |
| | | (0.376) | | (0.395) | | (0.274) |
| Union contract | | -1.759* | | 2.722* | | 0.669 |
| | | (0.924) | | (1.437) | | (0.946) |
| # of vehicles in family unit | | 0.168 | | 0.142 | | 0.157 |
| | | (0.207) | | (0.180) | | (0.135) |
| Perceived health | | 0.038 | | -0.125 | | -0.042 |
| | | (0.268) | | (0.237) | | (0.194) |
| Inheritance/gift in family unit | | 1.413 | | 0.220 | | 0.725 |
| | | (1.160) | | (0.709) | | (0.622) |
| Year dummies | √ | √ | √ | √ | √ | √ |
| Observations | 1 382 | 1 382 | 1 718 | 1 718 | 3 100 | 3 100 |
| R-squared | 0.001 | 0.004 | 0.006 | 0.008 | 0.002 | 0.003 |

**Note:** First difference estimates of weekly hours worked and daily commuting time in minutes for cohabiting individuals. A change in commuting time of less than five minutes is excluded to avoid measurement errors. Robust standard errors in parenthesis. *, **, *** show statistical significance of 10, 5 and 1 percent respectively.