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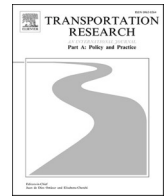
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Working from home during the corona-crisis is associated with higher subjective well-being for women with long (pre-corona) commutes

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ABSTRACT

Much research has been devoted to assessing the effect of commute duration on the subjective well-being of people, but as of yet, the respective body of research has been inconclusive as to whether there is indeed a (large) negative effect or not. To control the spread of COVID-19 governments around the world have taken unprecedented measures to control the outbreak of the Corona-virus. Forcing or strongly advising people to work from home (i.e. at least those who can) is often one of these. The ensuing situation can be considered a natural experiment; the government's intervention effectively cancels people's commuting trip and can be considered completely exogenous. Should commuting time indeed have an adverse effect on well-being, it may be expected that those workers with long (pre-corona) commutes who have transitioned to working from home will experience an increase in their well-being. This idea is tested by combining several surveys -timed before and after the crisis- from the Longitudinal Internet Studies for the Social sciences (LISS) panel, a panel that is representative of the Dutch population. In line with expectations, the results indicate that workers with a long commuting duration who transitioned to working from home indeed increased their subjective well-being. However, this effect was found to be significant only for women and not for men. A more general finding of interest is that subjective well-being did not change much between the measurements before and during the corona-crisis.

1. Introduction

Many people spend a considerable portion of their daily time commuting, in industrialised nations approaching an hour on average per day, amounting to 225 h or well over 9 calendar days per year (see e.g. [US census bureau, 2019](#); [TUC, 2019](#)). As the distribution of commuting time is strongly right-skewed, a substantial portion of the population (around 10%) even engages in extreme commutes of two hours or longer per day ([US census bureau, 2019](#); [TUC, 2019](#)).

Given these figures, researchers have rightfully concerned themselves with the questions if and how commuting, and in particular the commute duration, affects people's lives. In this regard, a prime focus has been to disentangle and assess the effects that the time spend commuting may have on subjective well-being, which is considered an important criterion in various research disciplines (e.g. in hedonic psychology and applied economics) as well as in the policy practice (see e.g. [Dolan et al., 2011](#)). Commuting may negative affect well-being via various pathways. The commute may be a source of stress which directly influences well-being ([Stokols and](#)

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Novaco, 1981; Evans, et al., 2002), but indirect paths are also plausible (Kroesen et al., 2014). For example, the commute time has been shown to pre-empt the time that a person spends on social activities (spending time with family and friends) or on health maintenance behaviours (preparing nutritious meals, physical exercise, sleeping time) leading to decreased well-being (Kroesen et al., 2014; Hilbrecht et al., 2014; Nie and Sousa-Poza, 2018). It has also been suggested that negative commuting experiences may spill-over to other life domains (work and home) thereby decreasing overall well-being (Novaco et al., 1990).

Chatterjee et al. (2020) recently provided a comprehensive overview of empirical studies examining the relationship between commuting duration and subjective well-being, which is typically measured using life satisfaction and/or mental health scales. Although quite a number of studies have been dedicated to this topic, including a number of recent ones, Chatterjee et al. (2020) conclude that no consistent pattern has emerged as of yet; some studies do find an (negative) effect of commute duration on well-being, whereas others do not. Even studies based on panel data (see e.g. Stutzer and Frey, 2008; Mytton et al., 2016; Chatterjee et al., 2020), which are able to reveal within-person effects and allow the researcher to control for (observed and non-observed) time-invariant variables, provide mixed results. With respect to these studies, the available evidence indicates that the effect of commute duration on mental health is stronger than its effect on life satisfaction (see e.g. Dickerson, 2014; Martin et al., 2014; Clark et al., 2019), that the effects are stronger for women compared to men (Roberts et al., 2011; Dickerson, 2014), and that the effects seem to be non-linear, i.e. only extreme commuting times/distances negatively affect well-being (Ingenfeld et al., 2019). In addition, in line with the “spill-over” hypothesis researchers have also found that commute duration is negatively associated with measures such as job, leisure and family life satisfaction (Lorenz, 2018; Sun et al., 2020).

Following micro-economic theory it may be argued that not finding an effect -while in fact there is- may be entirely plausible, since the commute time may be traded-off against certain benefits, for example, higher income or better housing. This explanation that is put forward by several authors (Clark et al., 2019; Chatterjee et al., 2020). Empirical evidence for this train of thought is provided by Morris and Zhou (2018) as well as Clark et al. (2019) who found that longer commute durations are associated with higher home ownership rates and higher incomes. This may also explain why even panel studies have difficulty in being able to consistently establish significant effects. If changes in commuting time are correlated with changes in income and/or better housing conditions, even fixed-effect models based on panel data will not be able to provide unbiased estimates if these (time-varying) variables are not included in the model. In addition, it remains unclear whether indeed all benefits are captured by these variables in the first place, e.g. longer commute duration may also benefit the partner in some way (Morris and Zhou, 2018). What complicates matters further is that fixed-effect models capitalise on within-person changes in commute durations, which may be relatively few. In practice, this means that estimated coefficients are based on relatively small numbers of within-person changes which may also be correlated with unobserved time-varying variables that relate to compensation benefits suppressing the effects of the commute duration.

Presently, governments around the world have taken unprecedented measures to control the spread of the coronavirus. Forcing or strongly advising people to work from home (i.e. at least those who can) is often one of these. The ensuing situation can be considered a natural experiment; the government’s intervention effectively cancels people’s commuting trip and can be considered completely exogenous. Moreover, this ‘benefit’ is received immediately for a large portion of the population, with no requirement to trade if off against less income or poorer housing (or any other benefit of a longer commute). As such, the ideal conditions are created to assess how this ‘exogenously forced’ decrease in commuting time influences the subjective well-being of people. Should commuting time indeed have an adverse effect on well-being, it may be expected that those workers who have transitioned to working from home, will experience an increase in their well-being, an effect that can be expected to be contingent on the duration of the pre-corona commuting time.

This idea is tested using data from the Longitudinal Internet Studies for the Social sciences (LISS), a longitudinal panel that is representative of the Dutch population. Respondents in this panel regularly complete surveys on various topics. By combining surveys over multiple years, it is possible to assess how the transition to work from home influences the (within-person) changes in subjective well-being, as a function of a person’s (pre-corona) commute duration. The timings of the surveys are well-suited to assess these effects.

2. Effects of working-from-home and positive effects of commuting

Before moving on to the empirical part of the paper, it is worthwhile to consider possible independent (positive and negative) effects of working from home on well-being (i.e. not directly linked to the presence or absence of a commuting trip) as well as possible positive effects of the commuting trip. Besides general commentaries on the effects of COVID-19 on transport (Budd and Ison, 2020; Musselwhite et al., 2020), two empirical studies performed after the beginning of the corona pandemic have shed light on the possible independent effects of working from home on well-being (Beck et al., 2020; Rubin et al., 2020). These will be briefly described in the following.

Rubin et al. (2020) performed an international survey in April 2020, which was completed by 1014 individuals (mostly from the Netherlands, but substantial portions from France, UK, USA and UK). The study revealed that the perceived disadvantages of working from home varied strongly depending on the presence of children (12 or younger) in the household. Among respondents without children the most important disadvantages were the lack of social contacts, difficulties with work-life balance, and difficulty to focus. For people with children the increase in household and care tasks was (by far) perceived as the most important disadvantage, followed by the lack of social contacts and difficulties with work-life balance. While the perceived disadvantages differed strongly for both groups, the groups agreed on the perceived advantages, which were (in order of importance) not needing to commute, the ability to combine work with other activities, and increased schedule flexibility. Given the reported (dis)advantages of working from home, these results provide little basis to hypothesise either a positive or negative effect of working from home on well-being.

The study of Beck et al. (2020) does provide shed some further light on this. While this study was mainly focused on explaining the

(continued) choice to work from home, their survey (conducted in May 2020 in Australia) also included several attitudinal statements regarding working from home. Descriptive analyses showed that the majority of the respondents (strongly) agreed with the statement that working from home has been a positive (71%) experience for them, only 15% disagreed with this statement. In addition, the majority of the respondents also (strongly) agreed with the statement that they would like to work from home more often in the future (71%), and again only a small portion disagreed with this statement (7%). This would suggest that the effect of working from home on well-being (on the balance of things) is likely positive, rather than negative. But obviously the specific conditions at the time of the survey may play a large role in this. In this study the independent effect of working from home on well-being will be explored, but no specific hypothesis (positive or negative effect) is formulated.

In addition to the effect of working from home on well-being, it is relevant to consider possible positive effects of the commuting trip. Indeed, there is a substantial body of research that has explored the intrinsic value of travel both conceptually (Mokhtarian, 2005; Mokhtarian et al., 2001) and empirically (Mokhtarian and Salomon, 2001; Redmond and Mokhtarian, 2001). Typical reasons include adventure-seeking, feelings of independence and control, exposure to the environment, physical exercise, and physical/mental therapy. Related to the commuting trip in particular it has been established that it may act as a buffer between the work and home environment, providing a temporary escape to obligations in both environments and/or the opportunity to transition and prepare for the new environment (Olsson et al., 2013; Jain and Lyons, 2008). These results are also confirmed by the study of Rubin et al. (2020) who found that a large majority (69%) of the respondents (in the post-corona period) stated they missed at least some aspects of commuting, including the activity of commuting itself, the ability to spend some time alone, and feeling independent.

Given the available evidence, it thus seems plausible to assume that short commutes may have positive effects of well-being. In the context of the present study, this would mean that for people who have transitioned to working from home and who had short (pre-corona) commute durations a decrease in well-being may be expected. This hypothesis will explicitly be explored in this research.

3. Method

3.1. Data and measures

The LISS panel is based on a true probability sample of households (~5000) drawn from the population register of Dutch households. Households that could not otherwise participate are provided with a computer and internet connection. Table 1 provides an overview of the surveys and measurements that were combined for the present analysis.¹ Only respondents that participated in and completed all surveys were selected, 1912 in total. Since the same respondents were repeatedly measured over time the dataset can be regarded as a true panel dataset.

The various surveys were administrated at essentially three points in time, which will be referred to as wave 1–3 (Fig. 1). Wave 1 took place during April/May 2019, 10 months before the outbreak of the pandemic. Wave 2 was administrated in the panel from March 20 to March 31, 2020, just after the first lock-down in the Netherlands on March 15. And wave 3 took place in May/June 2020, at a time when the Dutch government was gradually opening up society.

Table 2 shows the descriptive statistics of respondents' background characteristics in Wave 1. Unfortunately, no information could be obtained related to the population distributions of paid workers in the Netherlands. Nevertheless, the sample distributions do not give rise to any concerns as to the representativeness of the data.

Table 3 presents the descriptive statistics of the main (in)dependent variables used in the analyses. Commuting time was measured based on self-report in wave 1, which means that this measure was unaffected by the corona pandemic. The average commuting time is 27 min (one way). Fig. 2 shows that -in line with previous research- the distribution of commuting time is strongly right-skewed, with 9.8% having a (one way) commute duration of 60 min or more.

The survey in wave 2 was used to measure the amount of (and increase in) working from home. This survey included questions related to the average numbers of hours respondents worked at the workplace and from home at the beginning of March (before the coronavirus affected the work situation) as well as presently over the last 7 days. These figures were recoded to number of days assuming an 8-hour workday (with a max. of 5 days). Table 3 shows that in the pre-corona situation, people worked 3.8 days at the workplace and 0.6 days at home on average. After the lock-down, people worked 2 days at the workplace and 1.9 days from home. Using google mobility data it was verified that the changes in working from home at the moment of the third wave (May/June 2020) were still similar to the changes observed in wave 2 (March 20, just after the initial lockdown).

Subjective well-being is operationalised using the Satisfaction with Life Scale (SWLS) developed by Diener et al. (1985). This scale consists of 5 items that aim to measure people's cognitive evaluation of a person's life as a whole (e.g. "In most ways my life is close to my ideal"), which are rated on a 7-point scale from "completely disagree" to "completely agree". The scale purposefully does not tap into any particular life domain (e.g. home, work, etc.), leaving it to the respondent to integrate and weigh the various domains. In addition, the scale is distinct from affective well-being measures that aim to capture people's emotional well-being. As shown by numerous studies the scale has good psychometric properties, i.e. high convergent/discriminant validity and temporal consistency (Pavot and Diener, 2009). In the present analysis, the five items are summed and then normalised to a scale ranging from 1 to 10, to aid in the interpretation of the results.

The SWLS was administrated in wave 1 (May 2019) and in wave 3 (May/June 2020). This means that the first measurement is

¹ All data is freely available for academic use.

Table 1
Overview of surveys.

	Survey Name	Data collection period	Selected	Response	Variables
Wave 1	Work and Schooling (Wave 12)	April/May 2019	6,247	80.6%	Commuting time (2019)
	Personality (wave 11)	May 2019	6,218	80.7%	Satisfaction with Life Scale (2019)
	Background Characteristics	May 2019	*	100.0%	Gender, age, education level, main occupation, income, level of urbanity (2019)
Wave 2	Effects of the Outbreak of Covid-19	March 20–31 2020	6,817	80.0%	Workdays at workplace and from home (before and after pandemic) (2020)
Wave 3	Personality (wave 12)	May/June 2020	6,969	84.1%	Satisfaction with Life Scale (2020)
	Background Characteristics	May 2020	*	100.0%	Income (2020)

* All respondent complete the background characteristics when joining the panel and update this information on a monthly basis.

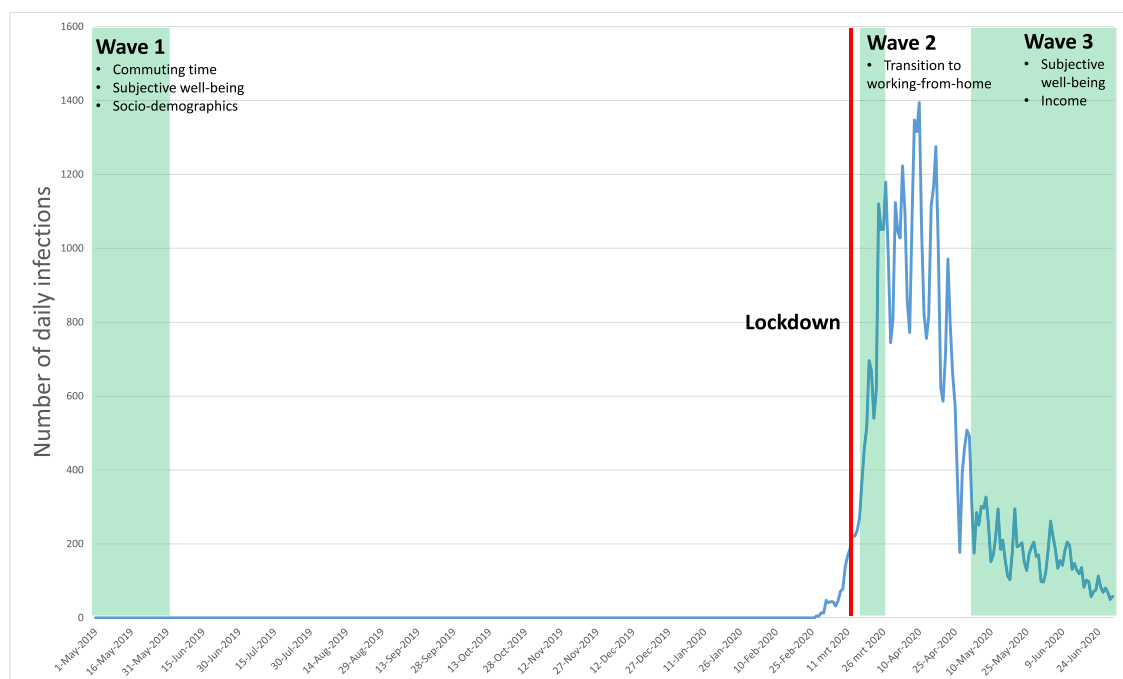


Fig. 1. Timeline including the timings of the surveys (and measurements), the initial lockdown and the number of daily infections in the Netherlands.

unaffected by the corona pandemic, while the second measurement took place two months after the initial lock-down in the Netherlands. This measurement took place at a time when the initial shock of the crisis/lock-down was over (which could have had a strong negative effect on the measurement), but still during a time at which working from home was still strongly advised. Looking at the sample means (Table 3), it is surprising to see that the SWLS score slightly (but significantly) increased between the two measurement occasions, from 7.25 to 7.32 ($t = 2.942$, $df = 1911$, $p = 0.003$).

3.2. Preliminary analysis and strategy

Since the (four) variables related to the number of working days at work and at home before and after the crisis are all strongly intercorrelated a preliminary explorative analysis was performed to avoid potential problems with multicollinearity and to parsimoniously capture the amount of working from home and the changes therein. To this end, a latent class model was estimated using the four variables as (ordinal) indicators of the model. Since the latent class analysis can capture the various patterns of stability and change, it is useful in identifying a single parsimonious measure for working from home to be used in the subsequent analysis.

To establish the optimal number of latent classes seven models were estimated with 1 through 7 latent classes. Based on a comparison of these models in terms of model fit and model parsimoniously, as well as substantive interpretability, it was concluded that the 4-class model provided the optimal number of classes.

Tables 4 presents the profiles of the four classes, reflecting different patterns of stability and change in working at work and from

Table 2

Descriptive statistics of the (socio-demographic) background variables (N = 1,912) in wave 1.

Variables	Categories	%
Gender	Male	49.2
	Female	50.8
Age	15–24 years	4.2
	25–34 years	17.4
	35–44 years	21.2
	45–54 years	27.9
	55–64 years	26.3
	65 years and older	3.1
Education level	Primary school	2.6
	Intermediate secondary education	12.5
	Higher secondary education/preparatory university education	9.4
	Intermediate vocational education	29.0
	Higher vocational education	30.6
	University	15.9
Main occupation	Paid employment	83.3
	Autonomous professional, freelancer, or self-employed	8.5
	Other	8.3
Net personal income	Less than EUR 1000	12.3
	EUR 1001 to EUR 1500	13.3
	EUR 1501 to EUR 2000	29.0
	EUR 2001 to EUR 2500	22.0
	EUR 2501 to EUR 3000	12.4
	More than EUR 3000	10.9
Level of urbanity (surrounding address density per km ²)*	Not urban (less than 500)	22.7
	Slightly urban (500–1000)	20.6
	Moderately urban (1500–2000)	17.9
	Very urban (2000–2500)	21.7
	Extremely urban (more than 2500)	17.0

* The level of urbanity is objectively calculated based on the postal codes of respondents' residence.

Table 3

Descriptive statistics of the main (in)dependent variables (N = 1912).

	Min.	Max.	Mean.	Std. Dev.
How many minutes do you usually need to travel between your home and your work (one way)? (wave 1)	0.0	200.0	27.00	21.67
Number of days at workplace at the beginning of March (or before the coronavirus affected the work situation) (wave 2)	0.0	5.0	3.81	1.37
Number of days at workplace in the past seven days (wave 2)	0.0	5.0	1.97	1.99
Number of days working from home at the beginning of March (or before the coronavirus affected the work situation) (wave 2)	0.0	5.0	0.59	1.12
Number of days working from home in the past seven days (wave 2)	0.0	5.0	1.87	2.04
Satisfaction with life scale (wave 1)	1.0	10.0	7.25	1.59
Satisfaction with life scale (wave 3)	1.0	10.0	7.32	1.56

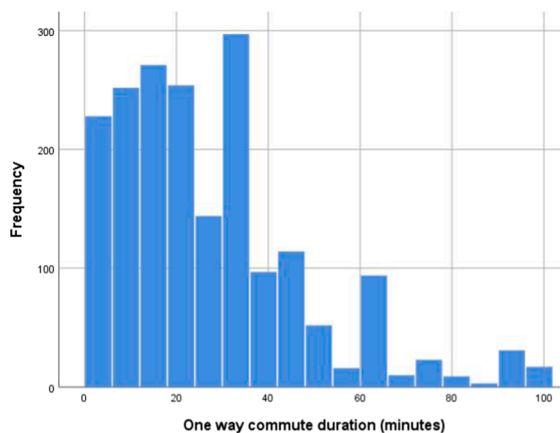


Fig. 2. The distribution of commute duration in wave 1 (N = 1912). Note: for this histogram values over 100 min were recorded to 100 to reduce the length of the X-axis.

home. The largest class (36.8% of the sample) consists of workers who transition almost completely from roughly 4 days working at the workplace to 4 days working from home, although they keep working at the workplace for 0.7 days on average. The second class, which is more or less equal in size (36.5% of the sample), reflect part-time workers who keep working at the workplace, but roughly one day less than before, which is only to a limited extent compensated by increased working from home. Class 3 (19% of the sample) consists of workers who were working 5 days at the workplace and continue to do so, likely capturing jobs for which working from home is not feasible. Finally, the fourth class reflects workers who already mostly worked from home before the pandemic. Again, the decrease in days at the workplace (from 1.3 to 0.3 days) is not fully compensated with the increase in working from home (from 3.1 to 3.4 days).

The latent class analysis supports the intuition that the variation in the four variables (i.e. days working from home and at work before and after the pandemic) could be parsimoniously captured by a single variable, namely a dummy variable indicating whether a person worked two or more days from home (coded as 1) or not (coded as 0). The last four rows of [Table 4](#) show the distributions of this variable (before and after the pandemic) conditional on the latent class membership, which were obtained by including the dummy variable as an inactive covariate in the model.² The distributions indicate that the dummy variable nicely captures the four patterns of change (class 1) and stability (classes 2–4). Hence, this variable was used in the subsequent analyses.

Before moving on to discussing the analysis strategy, it is relevant to note that the patterns of change and stability are strongly correlated with respondents' background characteristics, which were also included as inactive covariates in the latent class model. Workers who transition to working from home (class 1) are generally higher educated and belong more often to the higher income groups, while workers that keep working at the workplace (classes 2 and 3) are lower educated and earn less on average. Clearly, working from home is easier for jobs that require higher education levels. This means that, while the intervention of the government is exogenous, it only affects a specific part of the working population. Hence, it is relevant to emphasize that the results of the analyses are only generalizable to these groups.

To first assess the between-person effect of commute duration on subjective well-being a straightforward cross-sectional linear regression analysis was performed using only the measurements related to 2019. To accommodate non-linearity in the effect of commute duration on wellbeing (see [Ingenfeld et al., 2019](#)) (and capture possible positive effects of short commutes), the commute duration was recoded into three dummy variables that respectively capture commutes of 20–39 min, 40–59 min and 60 min and longer (one-way) (commutes of 0–19 min were used as the reference). This also prevents potential problems with outliers in the commute duration (which may act as leverage points). In a second step confounding variables are included to assess whether the effect of commuting is (indeed) suppressed by compensation benefits such as higher income and/or increased suburban living.

Next, to assess the effect of transitioning to working from home, a fixed-effect linear regression model is estimated, in which the working from home dummy variable is included as a main effect, and also interacted with the three commute duration dummies. It is expected that increasing working from home will increase well-being for those with long commutes and decrease well-being for those with short commutes. Income is also included as a relevant time-varying confounding factor, although, as mentioned in the introduction, the transition to working from home cancels workers commutes without inducing additional costs in terms of poorer income or housing. The fixed-effect model captures only within-person effects between time-varying variables, which also means that all time-constant variables drop out of the equation. Hence, it is not necessary (and, in fact, impossible) to include time-constant variables (e.g. gender, age) in the model. Nevertheless, since previous research has consistently revealed larger effects for women than for men, the fixed-effect model is also separately estimated for men and women in the sample.

For both the cross-sectional and the panel analysis linear regression models were used, even though the dependent variable (the SWLS) represents an ordinal scale. While this outcome is best modelled using ordinal (fixed-effect) regression models, the more straightforward linear models are used because the estimates are more easily interpretable. Moreover, previous research has shown that the estimates of a linear regression analysis (proportionally) match those of an ordinal regression model ([Norris et al., 2006](#)).

4. Results

[Table 5](#) shows the results of the linear regression analyses based on the (cross-sectional) data from 2019. The first model only includes three commute duration dummies and the second additionally includes respondents' background characteristics. In the first model, the effects of commute duration do not reach statistical significance. After inclusion of the background variables the effects of commute duration for the higher categories (40–59 min and 60 min or more) become negative, indicating that the effects are indeed suppressed to some extent, but they remain insignificant. The results indicate that women, people with higher education levels and higher income are significantly more satisfied with their life, while the level of urbanity has a negative effect on SWLS scores. For age, a U-shaped relationship is found, with younger (<34) and older (>54) respondents scoring higher than middle-aged individuals (34–54 years of age). Collectively, the background characteristics can only explain a small percentage of the variation in subjective well-being (4.3%).

[Table 6](#) presents the results of the fixed-effects models. The transition to working from home does not have a significant independent effect on well-being. Hence, while it has been reported that working from home is generally perceived as a positive experience ([Beck et al., 2020](#)), this does not translate itself into increased well-being, at least not in the Dutch context.

² Inactive covariates variables are not actually part of the model (i.e. in the sense that they predict class membership), but the conditional distributions for these variables can be calculated based on the posterior membership probabilities. This way they can aid in the interpretation of the classes without interfering with the classification itself.

Table 4
Patterns of stability and change in working at the workplace and from home.

		1	2	3	4
Cluster size (N = 1912) (%)		36.8	36.5	19.0	7.7
Indicators					
Days at workplace (before pandemic)	Mean	4.29	3.29	4.93	1.31
Days at workplace (presently)	Mean	0.72	2.05	4.91	0.26
Days working from home (before pandemic)	Mean	0.80	0.08	0.13	3.11
Days working from home (presently)	Mean	3.93	0.35	0.20	3.35
Covariates (inactive)					
Working 2 days or more from home (before pandemic)	No (%)	83.5	99.6	98.2	18.1
	Yes (%)	16.5	0.4	1.8	81.9
Working 2 days or more from home in past seven days	No (%)	6.3	90.4	96.1	17.9
	Yes (%)	93.8	9.6	3.9	82.1
Gender	Male (%)	54.7	31.5	72.4	51.5
	Female (%)	45.3	68.5	27.7	48.5
Age	15–24 years (%)	3.9	5.5	3.1	2.2
	25–34 years (%)	22.2	13.9	16.7	12.4
	35–44 years (%)	24.5	19.7	18.5	20.5
	45–54 years (%)	24.9	27.6	34.4	27.1
	55–64 years (%)	23.3	29.2	26.3	27.1
Education level	65 years and older (%)	1.2	4.1	1.1	10.6
	Primary school (%)	1.2	3.7	3.9	1.1
	Intermediate secondary education (%)	4.0	17.6	21.4	5.9
	Higher secondary education/preparatory university education (%)	8.6	12.3	6.9	6.6
	Intermediate vocational education (%)	17.0	37.0	41.5	16.8
Main occupation	Higher vocational education (%)	40.6	22.8	19.6	45.6
	University (%)	28.2	6.5	6.6	24.0
	Paid employment (%)	90.6	82.2	86.0	47.1
	Autonomous professional, freelancer, or self-employed (%)	4.8	5.5	8.7	38.8
	Other (%)	4.6	12.3	5.3	14.0
Net personal income	Less than EUR 1000 (%)	4.6	22.2	4.7	21.1
	EUR 1001 to EUR 1500 (%)	6.0	22.1	10.4	12.0
	EUR 1501 to EUR 2000 (%)	22.9	32.8	34.3	27.8
	EUR 2001 to EUR 2500 (%)	28.2	14.2	28.5	14.8
	EUR 2501 to EUR 3000 (%)	20.0	4.7	13.5	10.4
Level of urbanity	More than EUR 3000 (%)	18.3	4.1	8.7	14.0
	Not urban (%)	19.4	22.6	27.1	26.7
	Slightly urban (%)	18.5	22.4	21.5	18.0
	Moderately urban (%)	17.9	20.0	16.3	11.6
	Very urban (%)	22.9	20.4	19.7	26.7
	Extremely urban (%)	20.8	14.4	14.6	16.4

Table 5
Coefficients of the linear regression model predicting SWLS (2019).

	Estimate	p-value	Estimate	p-value
Intercept	7.203	0.000	5.955	0.000
Commuting time of 20–39 min (ref.: 0–19 min)	0.095	0.255	0.025	0.767
Commuting time of 40–59 min (ref.: 0–19 min)	0.037	0.738	−0.104	0.356
Commuting time of 60 min or more (ref.: 0–19 min)	0.029	0.822	−0.099	0.448
Female (ref.: male)			0.255	0.001
Age below 34 (ref.: 34–54)			0.256	0.007
Age above 54 (ref.: 34–54)			0.284	0.001
Level of education			0.122	0.000
Freelance (ref.: paid employment/other)			0.144	0.294
Net personal income			0.107	0.000
Level of urbanity			−0.073	0.004
Working 2 or more days from home (ref.: no)			−0.061	0.591
R-square	0.001		0.043	

Turning to the interactions between the working from home and the commute duration dummies, it can be observed that, in line with expectations, for those with a commute of 60 min or more, the effect of transitioning to working from home is indeed positive and significant ($p = 0.014$). Compared to the reference group (0–19 min), the SWLS score increases by 0.34 for people with a commute duration of 60 min or more (on a scale from 1 to 10). People with a commute duration of 0–19 min have decreased their well-being most compared to the other three categories, but the differences between this group and the groups with commute durations of 20–39 and 40–59 min do not reach statistical significance. Hence, the results do not suggest that the cancellation of a short commute (0–19

Table 6
Coefficients of the fixed-effect models predicting SWLS (2019–2020).

	Sample (N = 1912)		Male (N = 943)		Female (N = 969)	
	Estimate	p-value	Estimate	p-value	Estimate	p-value
Intercept	7.012	0.000	6.909	0.000	7.117	0.000
Working 2 or more days from home	−0.047	0.556	−0.016	0.898	−0.070	0.105
Working from home * commuting time 20–39 min	0.137	0.198	0.180	0.255	0.082	0.571
Working from home * commuting time 40–59 min	0.072	0.569	0.039	0.831	0.097	0.591
Working from home * commuting time 60 min or more	0.340	0.014	0.176	0.359	0.555	0.007
Income	0.057	0.100	0.056	0.261	0.057	0.211
R-square (within)	0.007		0.006		0.011	

min), which arguably acts most as a buffer instead of a hassle, leads to a (significant) decrease in well-being.

The models of men and women indicate that, for both groups and similar to the sample as a whole, working from home does not in itself have a significant effect on well-being. However, regarding the interaction between working from home and the commute duration of 60 min or more, the results show that the associated coefficient is considerably larger for women than for men. Women with pre-corona commute durations of 60 min or more, who transition to working from home (two days or more) increase their SWLS by 0.555 (compared to the reference group), which on a scale from 1 to 10 can be regarded as a substantial effect. For men, on the other hand, the coefficient is 0.176 and no longer significant ($p = 0.359$).

The finding that long commutes negatively affects women but not men aligns with earlier research reporting similar results. According to [Roberts et al. \(2011\)](#), women's greater sensitivity to commuting time may be a result of their larger responsibility for day-to-day household tasks, including childcare and housework. While this explanation may seem stereotypical, in the Netherlands it is still the case that women indeed have a greater role than men in the household. The Dutch national survey on time use (conducted in 2016) shows that women on average spend 26.5 h per week on household tasks (including taking care for others), whereas men only spend 17.4 h per week. In addition, these differences become larger for couples with children. In those households women spend 36.2 h on average on household tasks, while men spend 20.7 h ([Roeters, 2019](#)).

To explore this explanation further an additional set of regressions was estimated in which the sample was split by both gender and the presence of children in the household. However, the model parameters of women with and without children did not differ substantially, indicating that the observed positive effect of transitioning to working from home on well-being effect is not dependent on the presence of children. Hence, for women with children the absence of their commute did not lead to an additional positive effect, which undermines the explanation that the positive effect for women is associated with the fact that they are more involved in household tasks.

Finally, it should be noted that, while the models yield significant effects, the proportions of explained variance (at the within-person level) are very low (0.7–1.1%), indicating there is much variability in the data that is not accounted for by (changes in) the included independent variables.

Overall, the results are in line with studies that found an effect of commute duration on well-being for women, but not for men, namely those of [Roberts et al. \(2011\)](#) and [Dickerson et al. \(2014\)](#). In addition, the results also confirm the notion only very long commutes negatively impact well-being, which is in line with the study of [Ingenfeld et al. \(2019\)](#). The results contradict several (recent) panel data studies which reported no significant negative effect of commute duration on well-being, namely the studies of [Clark et al. \(2019\)](#) and [Lorenz \(2018\)](#). But, as noted by [Clark et al. \(2019\)](#), the lack of a negative within-individual association between commute duration and well-being may be due to the fact that workers are acting rationally and only take on longer commutes if there are compensating benefits (higher income), which [Clark et al. \(2019\)](#) indeed found to be the case in their study. Since these compensation benefits do not play a role in this study (the commute is cancelled without a loss of income), this may be a possible reason that a significant effect is observed in this study. In addition, compared to normal steady-state situations, much more within-person changes occurred due to the imposed government restrictions, which also increases the probability of finding a significant effect.

5. Conclusion and implications

Capitalising on the experimental conditions created by the Dutch government's policy to initially force and later strongly advise people to work from home as much as possible, this study examined the effects of transitioning to working from home on subjective well-being of workers having various pre-corona commute durations. The results indicate that workers with long commuting durations (60 min or more) who transitioned to working from home indeed increased their subjective well-being. However, this effect was found to be only significant for women and not for men. A more generic interesting finding is that subjective well-being did not change much before and after the corona-crisis. Obviously, this does not rule out possible long-term negative effects of the crisis on well-being.

The adopted approach in this study can be classified as methodologically strong. Firstly, the fixed-effect model captures within-person effects, which are generally the effects of interest, since it may be assumed that the processes that give rise to the effects also operate at the within-person level ([Kroesen and Chorus, 2020](#)). Secondly, the government's intervention directly affects a large part (36%) of the working population. As such, the effect is based on numerous within-person changes in the independent variable, more than in typical steady-state situations. And thirdly, the intervention is exogenous and, as such, also not correlated with changes in

time-varying variables that in normal conditions reflect ‘costs’ for having a shorter commuting trip.

A drawback of the present approach, however, is that the transition to working from home is correlated with respondents’ background characteristics, which means that the results are not generalizable to the entire working population. A second limitation is that it is assumed that commuting times have not changed in between the first and second measurement (wave 1 and wave 2). Of course, each year a part of the (working) population moves house and/or changes jobs, potentially resulting in a different commute time. And finally, while a significant and quite substantial effect could be established (for women), the R-square (at the within-person level) is quite low, indicating that much variation in the data remains that is not accounted for by changes in the included independent variables (working from home and commute duration).

To improve the predictive power of the models, it would be beneficial to incorporate relevant additional (time-varying) variables in the models (next to income), which may be related to changes in subjective well-being. Inclusion of these variables is also important to better understand the mechanisms through which working from home and/or the absence of a commute affect well-being. As shown by the research of [Rubin et al. \(2020\)](#), in addition to the absence of a commute, there are various advantages and disadvantages associated with working from home that may affect well-being. For example, the lack of social contacts with colleagues is likely a factor that negatively affects well-being. While the present results indicate that there is no significant independent (net) effect of the transition to working from home, it may be that the positive and negative effects of working from home on well-being have cancelled each other out. Ideally, a panel survey would include measures of all these aspects (satisfaction with social contacts, work-life balance, schedule flexibility, difficulty to concentrate, etc.) such that their effects on (changes in) well-being can be separately tested. Such an approach may also shed light on the question why differences are observed for men and women. Related to this, another relevant research direction would be to focus on the differences in commuting modes, in particular between active (walking and cycling) and inactive ones (the car), as it may be assumed that active modes of commuting do have positive effects on well-being ([Kroesen and De Vos, 2020](#)).

Finally, it is worthwhile to consider the relevance of the results in the policy context. A recent survey among companies in the Netherlands has shown that working from home is likely here to stay, with (at least) two days per week becoming the norm ([AWVN, 2021](#)). In this context, the present results are welcoming, in the sense that the transition to working from home in itself does not seem to have negative effect on well-being, and will even increase well-being for people (women) with long commute durations. Next to this, the increase in working from home obviously also has beneficial effects related to the reduction in car use (i.e. less congestion, risks and pollution). Hence, the present results clearly support policies by employers to (further) support working from home by improving working conditions at the home and/or offering financial allowances to reimburse the costs of working from home.

CRedit authorship contribution statement

Maarten Kroesen: Conceptualization, Methodology, Formal analysis, Investigation, Writing – original draft, Writing – review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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