Panel Data Research Center, Keio University

PDRC Discussion Paper Series

Gendered Effects of Telework on Subjective Well-being during Covid-19: The Case of Japan

Zhi-xiao Jia, Risa Hagiwara

15 March, 2023

DP2022-008
https://www.pdrc.keio.ac.jp/en/publications/dp/8517/

Panel Data Research Center, Keio University
2-15-45 Mita, Minato-ku, Tokyo 108-8345, Japan
info@pdrc.keio.ac.jp
15 March, 2023

Gendered Effects of Telework on Subjective Well-being during Covid-19: The Case of Japan

Zhi-xiao Jia, Risa Hagiwara

PDRC Keio DP2022-008
15 March, 2023
JEL Classification: I31; J16; J22
Keywords: Covid-19; gender; subjective well-being; telework; time allocation

Abstract

We investigate the effect of telework on employees' subjective well-being (SWB) in Japan during the Covid-19 period, with an emphasis on the potential gender discrepancies in the telework effect. We use the latest 4 available waves of Japan Household Panel Survey (JHPS) and its Covid-19 module conducted between early 2020 to early 2021 (i.e., within one year of the Covid-19 outbreak). Telework effect is estimated via both Fixed Effect (FE) and Difference in Difference (DiD) methods. We find that, telework decreases employees' SWB during Covid-19. However, this negative effect is significant only for males. We also find that, telework results in an expansion of housework and childcare hours for females. This is in line with gender expectations that females are caretakers, which would increase female teleworkers' affective utility following gender identity theory, and thus partially offset the negative affective effect from the increasing domestic burden. On the other hand, males' working hours are decreased when teleworking, which contradicts gender norms and would hence attenuate male teleworkers' affective utility. Although males' leisure time increases when teleworking, which would improve their SWB, the combined effect is still significantly negative. Thus, our results imply that Japanese males might still lexicographically value the conservative gender norm that males are breadwinners.

Zhi-xiao Jia
Faculty of Economics, Keio University
2-15-45 Mita, Minato-Ku, Tokyo
zxjia@keio.jp

Risa Hagiwara
Faculty of Economics, Meikai University
1 Meikai, Urayasu-City, Chiba
hagiwara@meikai.ac.jp

Acknowledgement: We are grateful to the Panel Data Research Center (PDRC), Keio University for providing the micro data of Japan Household Panel Survey (JHPS/KHPS) and its Covid-19 module, JHPS COVID-19 Special Survey (JHPS-COVID19). This study is supported by the Japan Society for the Promotion of Science (JSPS) Grant-in-Aid for Specially Promoted Research (22H04911) and Grant-in-Aid for Young Scientists (18K12799).

Gendered Effects of Telework on Subjective Well-being during Covid-19: The Case of Japan*

Zhi-xiao Jia
Keio University
zxjia@keio.jp

Risa Hagiwara
Meikai University
hagiwara@meikai.ac.jp

Abstract

We investigate the effect of telework on employees' subjective well-being (SWB) in Japan during the Covid-19 period, with an emphasis on the potential gender discrepancies in the telework effect. We use the latest 4 available waves of Japan Household Panel Survey (JHPS) and its Covid-19 module conducted between early 2020 to early 2021 (i.e., within one year of the Covid-19 outbreak). Telework effect is estimated via both Fixed Effect (FE) and Difference in Difference (DiD) methods. We find that, telework decreases employees' SWB during Covid-19. However, this negative effect is significant only for males.

* We are grateful to the Panel Data Research Center (PDRC), Keio University for providing the micro data of Japan Household Panel Survey (JHPS/KHPS) and its Covid-19 module, JHPS COVID-19 Special Survey (JHPS-COVID19). This study is supported by the Japan Society for the Promotion of Science (JSPS) Grant-in-Aid for Specially Promoted Research (22H04911) and Grant-in-Aid for Young Scientists (18K12799).

We also find that, telework results in an expansion of housework and childcare hours for females. This is in line with gender expectations that females are caretakers, which would increase female teleworkers' affective utility following gender identity theory, and thus partially offset the negative affective effect from the increasing domestic burden. On the other hand, males' working hours are decreased when teleworking, which contradicts gender norms and would hence attenuate male teleworkers' affective utility. Although males' leisure time increases when teleworking, which would improve their SWB, the combined effect is still significantly negative. Thus, our results imply that Japanese males might still lexicographically value the conservative gender norm that males are breadwinners.

Keywords: Covid-19, gender, subjective well-being, telework, time allocation

JEL classifications: I31; J16; J22

1. Introduction

The unprecedented worldwide epidemic of the Covid-19 virus has altered numerous aspects of human life, one of which is manifested in the massive and rapid adoption of telework as an anti-infection measure (Herrera et al., 2022, Okubo, 2022). Telework is a work style which allows employees to accomplish work at home due to advances in information and communications technology (ICT). Among its many claimed advantages (for instance, it enables a more flexible work scheduling, which might improve workers' perceived autonomy (Petcu et al., 2021)), its potential to enhance work-life balance is considered to be the most prominent one (Tremblay et al., 2006, Tremblay and Thomsin, 2012, Sullivan, 2012, Herrera et al., 2022). For instance, workers, especially female ones, could utilize remote work to concentrate more on domestic activities (e.g., caregiving) simultaneously while working (Giménez-Nadal et al., 2018, Kurowska, 2020). However, opposite views state that telework would blur the boundaries between paid work and family, and such "role ambiguity" would intensify the work-family conflict (Glavin and Schieman, 2012, Sullivan, 2012). Since work-life conflict is one crucial determinant of individuals' subjective well-being (SWB) (Shams and Kadow, 2019, Piccitto et al., 2022), it is thus ambiguous that whether telework finally results in a positive effect on workers' SWB. In fact, some literatures have found that telework reduces individuals' SWB (e.g., Song and Gao, 2020, Xiao et al., 2020, Schifano et al., 2021, Senik et al., 2022, Gueguen and Senik, 2022).

In addition, as Chung and Lippe (2020) summarized, there exists potential gender discrepancies in the outcome of telework. For instance, females may conduct more housework and childcare when working

from home while male teleworkers may not do so, which could be attributed to the pre-existing gendered division of labor that females are caretakers (Piotrowski et al., 2019, Sato, 2022). If telework does lead to gendered adjustments of subsequent behaviors, which associates with work-life interfaces, we could expect that the effect of telework on SWB also varies by gender. In fact, the gender differences in the effect of telework on SWB has also been documented in previous studies (e.g., Giovanis, 2017, Giménez-Nadal et al., 2018, Song and Gao, 2020, Senik et al., 2022).[2] If the abovementioned gender norms are ingrained, individuals are likely to be hesitant to act in ways far removed from their own gender. As a result, adhering to ((reluctant) deviation from) the gender expectations would augment (attenuate) individuals' affective utility following the gender identity theory of Akerlof and Kranton (2000). From this perspective, we could expect that more commitment to housework and childcare through teleworks would increase the SWB for female teleworkers under the gender role division attitudes, since they could better meet family demands (Sato, 2022).

We investigate the effect of telework on happiness, mental health (Kessler Psychological Distress Scale (K6)), and subjective productivity (self-evaluated job performance) in Japan during the Covid-19 period, and both overall effect as well as heterogenous effect by gender are estimated. Japan is suited to our analyses due to following reasons. First, it was not until the Covid-19 pandemic that the telework system was adopted by Japanese firms. According to the aggregated data from Japanese Panel Study of Employment Dynamics (JPSED), 14.1% and 15.5% of employees were eligible for telework in December

[2] However, no consensus has been reached on which gender is happier while telecommuting.

2020 and December 2021, respectively, while the corresponding percentage was only 4.2% in December 2019. The fact that teleworkers have become a non-negligible share of all Japanese employees since the outbreak of pandemic in early 2020 ensures the meaningfulness of our analyses. In addition, the rapid expansion of telework should be attributed to the Covid-19 shock. Through utilizing such exogenous switch to home-based work, the causality between telework and SWB could be inferred. Second, Japan is a country where the gender role attitude remains strong (Taniguchi and Kaufman, 2014, Piotrowski et al., 2019, Sato, 2022). As Kurowska (2020) illustrated, the "doing gender effect" (West and Zimmerman, 1987), that is, to behave in line with gender stereotypes, is stronger in societies with more traditional gender norms. We therefore expect the existence of the gendered behavioral adjustments in response to the change of workplace, which in turn, implies the potential gendered effect of telework on SWB.

One contribution of this study is to focus on the gender-specific effect of telework, and try to explain such gender discrepancies by gender identity theories. Hence, this paper could be expected to shed some light on the gender normative views in Japan. Another contribution of our work is to use an intensive household panel survey which has four available waves from early 2020 to early 2021 (i.e., within one year of the Covid-19 outbreak). Literatures on the effect of working from home on SWB during the Covid-19 period using large-scale micro surveys are sparse (e.g., Senik et al. (2022) for German, Etheridge et al. (2020), Gueguen and Senik (2022) for Britain, Schifano et al. (2021) for several E.U. nations),[3] and one

[3] Some other studies relied on self-collected data (e.g., Xiao et al., 2020). These inferences, however, are likely to be biased due to the small sample size and unrepresentative sampling.

reason is the lack of intensive (e.g., biannual, or monthly) longitudinal survey covering 2020 to 2022 especially outside European countries and the U.S. The SWB and the prevalence of telework kept fluctuating in response to the seriousness of pandemic (e.g., the number of infections/deaths) throughout 2020 to 2022, and such fluctuation is also associated with the strictness of anti-Covid-19 policies (Clark and Lepinteur, 2022, Okubo, 2022). Japanese government issued the so-called State of Emergency Declaration (SED) in April to May of 2020 national-wide, a kind of pandemic lockdown, which accelerated the switch to telework. SED was rescinded in the remaining months of 2020, while it was re-implemented in metropolitan areas (e.g., Tokyo, Osaka, and Aichi) in January to March of 2021. The resulting frequent variations in SWB and telework rate may not be sufficiently captured by merely the annual or biennial surveys, and the estimates would be attenuated if relied on such datasets. This paper extends the analysis of the telework effect on SWB during the Covid-19 period to Japan, relying on the latest 4 available waves of Japan Household Panel Survey (JHPS) and its Covid-19 module, JHPS Covid-19 Special Survey (JHPS-Covid19), conducted in February 2020, May-June 2020, October-November 2020, and January 2021, i.e., since the virus outbreak. Hence, our data could be expected to exploit the abovementioned variations to infer the effect of telework on SWB. Considering that the extensive transfer to remote work took place in April 2020 (that is, with the promulgation of SED) although the telework had already been gradually adopted by Japanese firms to avoid infections in February to March 2020, we also estimate the effect of such switch to telework using a Difference in Difference (DiD) approach.

We found that, telework decreases SWB during the Covid-19 period. However, this negative effect is significant only for males, especially husbands (married males). By analyzing the effect of telework on how individuals allocate their time for paid work and domestic production, we found the doing gender effect which could be used to interpret our findings that females are less negatively affected by telework. The remainder of this paper is structured as follows: Section 2 introduces the related literature, Section 3 describes the data and empirical method, Section 4 presents the results, and Section 5 concludes.

2. Literature review

When it comes to the term "work from home", existing literatures have examined both the effect of telework or telecommuting, that is, formal paid work at home during normal business hours (Song and Gao, 2020, Kazekami, 2020), and informal unpaid overtime work at home (Ojala et al., 2014, Song and Gao, 2020). We do not estimate the effect of the latter in the current study, since our data does not contain such information. Throughout this paper, we use the term "telework", "work from home", "home-based work", etc. interchangeably, while all of them refer to the home-based formal paid work during normal business hours. One mainstream of literature investigated the effect of working from home on perceived work-life balance and intra-household time allocation. For example, Giovanis (2017) and Giménez-Nadal et al. (2018) documented a reduction (increase) in working hours (leisure time and housework time) due to telework.[4] In recent years, a few literatures have used large-scale micro data to

[4] Meanwhile, Ojala et al. (2014) found that informal overtime work at home induces a neglection of home issues, and makes spouse consider that the respondent works too hard.

directly estimate the effect of working from home on employees' SWB. Giménez-Nadal et al. (2018) used the Well-being Module of American Time Use Survey (ATUS) conducted in 2012 and 2013. Their OLS inference showed that, male teleworkers enjoy higher "net" happiness (i.e., the feeling of happiness minus the average feeling of pain, sadness, fatigue, and stress) than male commuters. On the other hand, telecommuting exerts an insignificant minor negative effect on net happiness for female teleworkers.

Song and Gao (2020) pointed out that OLS takes no account of unobservable induvial heterogeneities, which might distort the estimation. They used 2010, 2012 and 2013 Well-being Module of ATUS, and estimated by fixed effect (FE). Although ATUS is cross-sectional, each respondent reports her activity (working, doing chores, etc.) and instantaneous feeling (happy, pain, etc.) three times on the survey day. In other words, each respondent is observed three times, which means that the longitudinal inference is feasible. They found that telework brings more stress for both females and males. Specifically, they found that the effect of telework varies with parental status (whether having child or not). For instance, mothers (fathers) who telework feel less happy (more stressed), while telework does not affect the instantaneous feelings of child-less females and males.[5] Such gender inequality in SWB was also illustrated in Giovanis (2017), in which female teleworkers were found to be happier than female commuters, while no significant gap in happiness between teleworkers and non-teleworkers was found for males. In a recent study, Kazekami (2020) used Japanese Panel Study of Employment Dynamics (JPSED) collected in 2017 and 2018, and estimated the effect of telework on SWB in Japan. Using ordered logit regression, they

[5] Song and Gao (2020) also estimated the effect of bringing work home. They found that it deteriorates SWB.

showed that teleworkers are happier and enjoy higher life and work satisfactions than their commuter counterparts. However, teleworkers also suffer from more stress.

We extend the analyses to the Covid-19 period using a comprehensive panel household survey spanning 2020 to 2021 with 4 waves (Section 3 shows details). Several studies have estimated the effect of telework on employment, income, health and living habits, etc. during the pandemic. For instance, Angelucci et al. (2020) relied on the Understanding America Study (UAS), a panel survey, conducted from March to July of 2020 with 9 waves. Using FE method, they found that non-remote workers are more vulnerable to unemployment, and show higher subjective infection risk during the pandemic. Their work conveys that teleworkers are more satisfied during the pandemic. Meanwhile, studies directly estimating the telework effect on SWB (life satisfaction, mental stress, subjective productivity, etc.) have also been accumulated. These studies relied on either independently-designed or large-scale micro survey and documented either a detrimental effect of telework (Xiao et al., 2020, Schifano et al., 2021), or an insignificant effect (Etheridge et al., 2020). Some studies analyzed the effect of stringency of lockdown and found that it deteriorates life satisfaction (Clark and Lepinteur, 2022), which implies a negative effect of telework on SWB, considering that the strength of lockdown, or, the seriousness of the pandemic, is positively corelated with the propensity of telework (Okubo, 2022).

Specifically, Gueguen and Senik (2022) used the UK Household Longitudinal Survey (UKHLS) and its Covid-19 Module. They adopted a difference in difference (DiD) approach, and found that for individuals who are able to work from home during the pandemic (i.e., "teleworkable" ones), switching to telework

after the outbreak of Covid-19 deteriorates their mental health. In addition, such negative effect is more prominent during the beginning phase of Covid-19.[6] Using the method similar to Gueguen and Senik (2022), Senik et al. (2022) also documented a detrimental effect of working from home on life satisfaction in Germany.[7] Just as pre-pandemic studies (e.g., Giovanis, 2017, Song and Gao, 2020), post-pandemic ones also illustrated a heterogeneous effect of telework by gender and marital/parental status. For example, Senik et al. (2022) found that men suffer more (women suffer less) from telework, while this negative effect is alleviated for married males (exacerbated for females with children above school age). On the other hand, Lyttelton et al. (2020)'s descriptive analyses showed that, females are more vulnerable to negative affect (anxiety, loneliness, depression, and hopelessness) than males.

3. Data and methods

[6] Gueguen and Senik (2022) and some other studies (Lyttelton et al., 2020, Senik et al., 2022) also discussed the intensity of telework i.e., the difference in subjective well-being between those who always telework and those who mix telework and office-based work. We do not emphasize this issue in this study, since our data does not contain reliable measurement of telework intensity (See Section 3.2 and Footnote 7 for details).

[7] In addition, Ishii et al. (2021a) relied on a Japanese cross-sectional survey conducted in April-May 2020. Their OLS and instrumental variable (IV) inferences showed that telework increases the anxiety that one cannot receive the proper information about work affairs. Ishii et al. (2021b) relied on Japanese Household Panel Survey (JHPS) and JHPS Covid-19 Module, the same survey series as our study. Using February 2020 wave, May-June 2020 wave, and October-November 2020 wave, they found that telework improves the mental conditions of individuals who keep teleworking throughout 2020 using first difference (FD) method. Compared with Ishii et al. (2021b), we use one additional wave of survey (February 2021 wave). Besides, we estimate the catch-all effect of telework, and also estimate the effect of transfer from office-based work to home-based work using DID approach. Heterogenous effect by gender and marital status is also studied. Ishii et al. (2021a) and Ishii et al. (2021b) are only available in Japanese.

3.1 Japan Household Panel Survey (JHPS) and Japan Household Panel Survey Covid-19 Special Survey (JHPS-Covid19)

We use the Japan Household Panel Survey (JHPS) and Japan Household Panel Survey Covid-19 Special Survey (JHPS-Covid19) conducted by Panel Data Research Center (PDRC) of Keio University. JHPS is an annual Japanese national-representative household longitudinal survey focusing on individuals aged 20 and above, and it was initiated from 2004 with a sample of 4,000 households and approximately 7,000 individuals. In order to enlarge the sample size and to reduce the sample attrition problem, new samples were supplemented in 2007, 2009, 2012, and 2018. JHPS covers topics like education and training, employment, time allocation, intra-household relation and living arrangement, SWB, household income and expenses, etc., and it is conducted in each February.

Since 2020, the outbreak of Covid-19, JHPS-Covid19, a supplementary panel survey of JHPS, has been conducted twice a year. The first wave of JHPS-Covid19 was conducted in May-June of 2020, right after the promulgation of the first SED during April-May 2020 (Section 1 introduced the background of SED). The 1st JHPS-Covid19 surveyed those who responded to 2020's JHPS survey, and the response rate is 71%. The 2nd JHPS-Covid19 was conducted in October-November of 2020, and it surveyed those who responded to the 1st JHPS-Covid19 with a response rate of 83%. JHPS-Covid19 focuses on employment, health, time allocation, and SWB in the Covid19 period and attitudes towards pandemic.

The latest waves available are first 2 waves of JHPS-Covid19 and 2021's JHPS. As a side note, JHPS2021

was conducted in February 2021, during which the government issued the second SED to certain metropolitan areas such as Tokyo. We append JHPS and JHPS-Covid19 to construct an integrated panel (just like what Senik et al. (2022) and Gueguen and Senik (2022) did), and the structure of this panel is shown in the following table:

Table 1 Structure of the integrated panel

survey name	JHPS2004	...	JHPS2019	JHPS2020	JHPS-Covid19_1	JHPS-Covid19_2	JHPS2021
survey period	Feb. 2004	...	Feb. 2019	Feb. 2020	May-Jun. 2020	Oct.-Nov. 2020	Feb. 2021
wave no.	1	...	16	17	18	19	20

We use wave 17 (JHPS2020), wave 18 (1st JHPS-Covid19), wave 19 (2nd JHPS-Covid19), and wave 20 (JHPS2021), i.e., the waves since the outbreak of the pandemic. Following Giménez-Nadal (2018), Song and Gao (2020) and Kazekami (2020), we drop unemployed and self-employed individuals, as well as retired individuals, i.e., those aged 65 or above. After neglecting outliers and missing values, we have 4,917 observations in our basic specification.

3.2 Main variables and measurement

Since wave 8 (JHPS2011), the following question regarding SWB is asked about:

(abbreviated) "Please report your feeling of happiness ***during the past week***, on a scale of 0 to 10, with 0 being extremely unhappy, and 10 being extremely happy."

We use this weekly happiness to measure individual's affective utility. Throughout this study, we treat this variable as continuous and use linear regression design. As previous studies pointed out and shown (e.g.,

Ferrer-i-Carbonell and Frijters, 2004), using linear model leads to similar results as using nonlinear models such as ordered logit.

Since wave 16 (JHPS2019), the Kessler Psychological Distress Scale (K6) has been introduced to the survey to capture mental stress and illness. Respondents report their feelings regarding nervousness, hopelessness, fidgetiness, depression, tiredness, and worthlessness *during the past 30 days* on 1-5 scales, in which 1 (5) refers to always (never) having a certain feeling. Following, for instance, Gueguen and Senik (2022), we sum answers to these 6 items to construct a continuous mental health score, i.e., K6 score, running from 6 (extremely mentally unhealthy) to 30 (extremely mentally healthy). Additionally, JHPS and JHPS-Covid19 also inquire about self-evaluated job performance, i.e., subjective productivity, ***in the past month*** on a 0-10 scale since wave 16, in which 0 and 10 refers to worst performance and best performance, respectively. We also estimate the effect of working from home on K6 score and subjective productivity, and the latter is also linearly treated as weekly happiness.

In the first wave of JHPS-Covid19, both days of telework per week and hours of telework per week are observed in: (1) the 4th week of February 2020, (2) the 4th week of March 2020, and (3) the 4th week of April 2020. In the second wave of JHPS-Covid19, days and hours of telework per week are observed in: (1) the 5th week of July 2020, (2) the 5th week of August 2020, and (3) the 3rd week of September 2020. On the other hand, JHPS2021 asks about the percentage of telework in: (1) the 4th week of April 2020, (2) the 5th week of August 2020, and (3) the 4th week January of 2021 on 0-10 scales, in which 0 and 10 refers to never telecommuting and always telecommuting, respectively.

We use telework status in the 4th week of April 2020, 3rd week of September 2020, and 4th week of January 2021 from 1st JHPS-Covid19, 2nd JHPS-Covid19, and JHPS2021, respectively. As for JHPS2020, since it was conducted in February 2020, hence we use telework status in the 4th week of February 2020 from 1st JHPS-Covid19 to measure telework status of JHPS2020's respondents. As JHPS2020, 1st JHPS-Covid19, 2nd JHPS-Covid19, and JHPS2021 was respectively conducted in February 2020, May-June 2020, October-November 2020, and February 2021, and SWB is measured within the past 7 days (happiness) or 30 days (K6 and subjective productivity) of these periods, hence using telework statuses closest to these periods ensures a more convincible relation between telecommuting and SWB. Telework dummy equals 1 if ***both*** days ***and*** hours of telework are greater than 0,[8] or the percentage of telework is greater than 0.

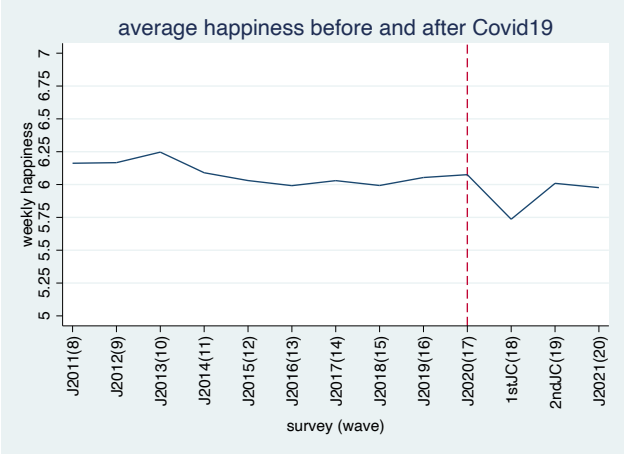
3.3 Happiness and telework in Japan: before and after the outbreak of Covid-19

Figure 1 shows how average weekly happiness evolves before and after the outbreak of pandemic. In general, there exists a slight downward trend in average weekly happiness: from around 6.20 in 2011 to

[8] In JHPS and its Covid-19 module, some respondents who telework more than one day per week report that their hours of telework per week equals zero (in pooled sample of 1st and 2nd rounds of JHPS-Covid19, for instance, 49 out of 793 individuals with weekly telework days more than one report that their weekly telework hours is zero). Hence, we use both days and hours of telework to identify teleworkers (in comparison, Ishii et al. (2021b), which also used JHPS and its Covid-19 module to infer the telework effect (See footnote 6), only relied on days of telework to define telework dummy). We also choose not to study the difference between those who always telework versus those who sometimes telework, since without explicitly measuring the level of telework intensity, "pure" teleworkers cannot be distinguished from those who mix telework and office-work. Although JHPS2021 directly asks the percentage of telework, which makes such inference possible, only using one wave of data means an inconvincible estimates due to a much smaller sample and the infeasibility of panel approach.

around 6.00 in 2021. Interestingly, a relative sharp drop appears immediately after the outbreak of Covid-19: from 6.08 in wave 17 to 5.74 in wave 18.[9] After wave 18, it rebounds to around 6.00, which matches the general trend.

Figure 1 Evolvement of happiness



Note: J and JC refers to JHPS and JHPS-Covid 19, respectively.

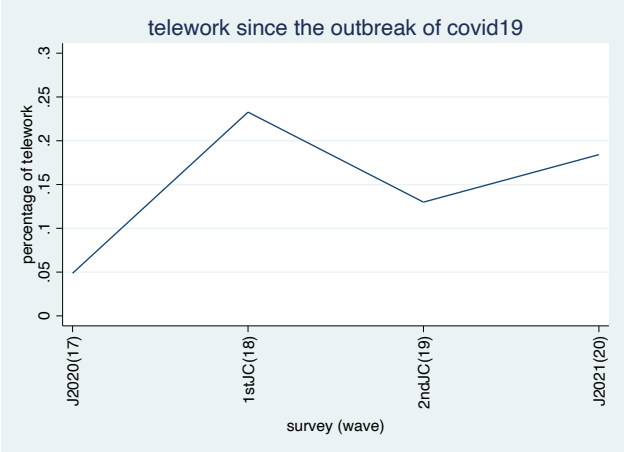
Figure 2 shows the evolvement of telecommuting rate since the outbreak of Covid-19. As it shows, roughly 5% of respondents did some telework in the 4th week of February 2020, around which the virus had just begun to spread, and firms had begun to adopt telework system. Such adoption was accelerated by the first SED which was in effect nation-wide in April to May 2020, and the telework rate rose to nearly 25% in April 2020. The percentage of telework decreased by 10% in September 2020, i.e., after the first SED, while rebounded to nearly 20% in February 2021, during which the government issued the second SED in restricted areas.[10] Patterns in Figure 1 and 2 illustrate that both SWB and telework rate

[9] Regressing weekly happiness on wave dummies using FE method reveals a similar pattern of happiness evolvement as that in Fig.1.

[10] Regressing telework dummy on wave dummies using fixed effect method reveals a similar trend as Fig.2.

fluctuate during the Covid-19 period in response to the seriousness of the pandemic and/or the strictness of anti-pandemic policies, which justifies the importance of using intensive longitudinal surveys covering this period to better capture such fluctuations in order to alleviate attenuation in estimates.

Figure 2 Evolvement of telework rate

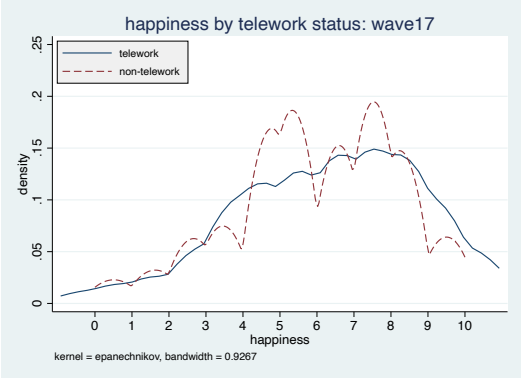


Subpanel (a), (b), (c) and (d) of Figure 3 presents the distribution of happiness by telecommuting status in wave 17, 18, 19 and 20, respectively. In all these periods, happiness distributions show a similar pattern: teleworkers seem to be slightly happier than their commuter counterparts. However, such crude comparison does not take other covariates, especially unobservable individual characteristics (i.e., individual fixed effect) into consideration, which might lead to biased conclusions.[11]

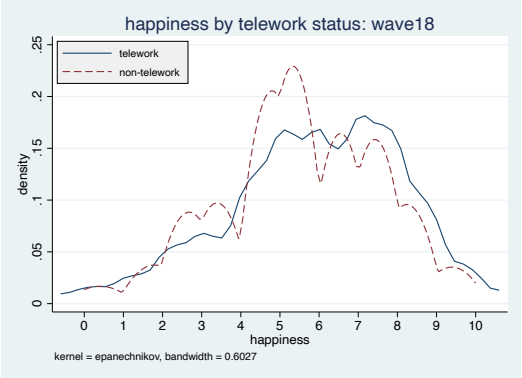
Figure 3 Distribution of happiness by telework status

(A) wave 17 (JHPS2020)

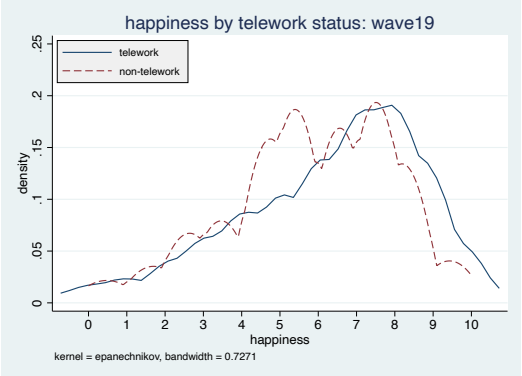
[11] We also used Pooled OLS to estimate the effect of telework on happiness as preliminary analyses. After controlling several personal and occupational characteristics (these covariates will be introduced in Section 3.4), telework exerts a significant positive effect on happiness, which is consistent with the patterns shown in Figure 3. These results are not provided as they are problematic without considering unobservable individual characteristics.



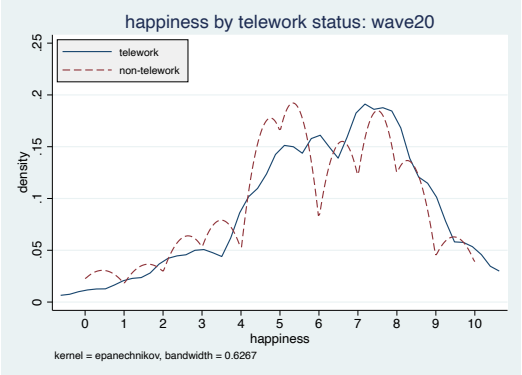
(B) wave 18 (1st JHPS-Covid19)



(C) wave 19 (2nd JHPS-Covid19)



(D) wave 20 (2nd JHPS-Covid19)



3.4 Estimation methodologies

3.4.1 Effect of working from home since the outbreak of Covid-19

We first estimate the following equation:

$$h_{it} = \alpha + \beta tw_{it} + \gamma X_{it} + \delta Z_i + \lambda_t + u_i + \varepsilon_{it} \quad (1)$$

Subscript i and t indexes individual and survey round (t = 17, 18, 19, 20), respectively. h_{it} and tw_{it} refers to happiness and telework, respectively. Measurement and descriptive characteristics of these two have been shown in Section 3.2 and 3.3. In addition to happiness, self-evaluated job performance as well as K6 are also used as dependent variables as Section 3.2 discussed. X_{it} and Z_i refers to time-variant and time-invariant covariates, respectively. We control for several personal and occupational characteristics, including categorical age dummies (20s (ref-group), 30s, 40s, 50s, and 60-64), categorical education dummies (junior high school (ref-group), senior high school, junior college, university, graduate school, and others), gender (female dummy), marital status (whether having spouse), log month income, weekly working hour, whether joining labor union, whether being regularly employed, 17 dummies for industry of workplace, 5 dummies for size (i.e., number of staffs) of workplace, as well as 7 dummies for living area. Daily one-way commuting minutes and weekly chore hours (housework hours plus childcare hours) are also controlled. At last, we incorporate a dummy for living with people who need care, and a dummy for the presence of preschool aged (aged 5 or below) child. Descriptive statistics for these covariates are provided in the Appendix Table A-1. α and ε_{it} refers to intercept and error term, respectively. β, γ, and

δ are the coefficients to be estimated, and β refers to the telework effect. λ_t is the wave fixed effect (wave dummies). u_i refers to unobservable individual heterogeneities which is assumed to simultaneously affect happiness and telework status. Hence, we use fixed effect (FE) method to estimate Equation (1).

3.4.2 Effect of the switch to telework: Difference in difference (DiD) estimation

Equation (1) is estimated in wave 17-20. However, in February 2020, around which the wave 17 took place, even though the virus had begun to spread and telework had been adopted by some leading firms, the massive policy-oriented transfer to telework has not occurred yet. Thus, in addition to the average effect of telework since the outbreak of Covid-19, we will also investigate whether the transfer from office-based work to home-based work from wave 17 to wave 18 (as Figure 2 depicts) affects happiness or not. In other words, we are interested in whether happiness rises or falls for individuals who hold teleworkable jobs after such transfer. Hence, we apply the following DiD estimation following Gueguen and Senik (2022):

$$h_{it} = \alpha + \beta_0 cd_{it} + \beta_1 twable_i + \beta_2 (cd_{it} \times twable_i) + \beta_T T_{it} + \gamma X_{it} + \delta Z_i + \lambda_t + u_i + \varepsilon_{it} \quad (2)$$

In which

$$T_{it} = cd_{it} \times twable_i \times tw_{it} \quad (3)$$

In Equation (2), cd_{it} is a dummy variable equals 1 if the survey was conducted in wave 18, 19, or 20, i.e., completely after the transfer. $twable_i$ is a time-invariant dummy indicating those who have ever

teleworked in either wave 18, 19, or 20 at least once. In other words, $twable_i = 1$ denotes teleworkable respondents (for instance, if Ms. Eve performed telework in wave 18 while went back to office in wave 19 and 20, then $twable_i$ equals 1 for her). T_{it} is the treated variable, and its coefficient β_T captures the effect of transfer to home-based work for those who are able to telework (for Ms. Eve, T_{it} respectively equals 0 (0×1×0), 1 (1×1×1), 0 (1×1×0), and 0 (1×1×0) in wave 17, 18, 19, and 20). Since we concentrate on the effect of switch to telework that took place between wave 17 and 18, we drop respondents who have already worked from home before such switching, that is, teleworkers in wave 17, when performing DiD inference.

It should be noted that the telework status in wave 18 is observed in April 2020. Around that period, in addition to the firms that had been adopting telework system, the nation-wide SED exerted an extra exogenous shock prompting teleworkable workers to work from home. However, this extra governmental shock is absent in wave 19, during which the SED had ended, and it is weaker in wave 20, during which the SED was implemented only within certain prefectures. Hence, we could here conclude that the exogeneity underlying the transfer to telework is (much) stronger in wage 18, which means that it is important to disentangle the effect in wave 18 to those in wave 19 and 20. Thus, the following equation will be estimated:

$$h_{it} = \alpha + \beta_0 cd_{it} + \beta_1 twable_i + \beta_2 (cd_{it} \times twable_i) + \beta_{T18}(T_{it} \times w_{18it}) + \beta_{T19}(T_{it} \times w_{19it}) + \beta_{T20}(T_{it} \times w_{20it}) + \gamma X_{it} + \delta Z_i + \lambda_t + u_i + \varepsilon_{it} \quad (4)$$

In which dummy w_{18it}, w_{19it}, and w_{20it} indicates wave 18, 19, and 20, respectively. Hence, β_{T18}, β_{T19}, and β_{T20} refers to the effect of transfer to telework in wave 18, 19, and 20, respectively.

4. Results and discussion

4.1 Catch-all effect of telework on subjective well-being

Fixed Effect analyses

We first estimate the β in Equation (1), that is, the average effect of home-based work on SWB since the outbreak of Covid-19 in early 2020. Results are displayed in Table 2.

Table 2 Catch-all effect of telework (FE)

	(1) WH	(2) WH	(3) WH	(4) WH	(5) K6	(6) SP
telework	-.15438*	-.26789***	-.27557***	-.2755***	-.33715*	-.29345***
	(.08314)	(.09117)	(.09667)	(.09685)	(.19395)	(.1088)
Observations	6527	4917	4647	4630	4761	4760
R-squared	.01406	.01867	.02296	.02457	.05589	.04534
groups	2551	2127	2053	2048	2059	2057
personal and occupational traits	No	Yes	Yes	Yes	Yes	Yes
time allocation	No	No	Yes	Yes	Yes	Yes
living arrangements	No	No	No	Yes	Yes	Yes

Robust standard errors are in parentheses. *** p<.01, ** p<.05, * p<.1.
WH and SP refers to weekly happiness and subjective productivity (self-evaluated job performance), respectively. Wave fixed effect and constant term are controlled in each specifications.

Only wave dummies are additionally controlled in Column (1), and telework exerts a marginally significant negative effect on short-term happiness (-0.154 with 0.05≤P<0.10). In Column (2), personal and occupational characteristics (see Section 3.4.1) are controlled, and the effect of telework becomes greater and much more significant (-0.268 with P<0.01). Estimates remain stable after time allocation (commute time and chore time) and living arrangement (co-residence with people in need of care and having pre-

school aged kids) are accounted for as Columns (3) and (4) illustrate. Meanwhile, telework is also detrimental to mental health and subjective productivity, although the estimates on mental stress is only significant at 0.05≤P<0.10 level. These results indicate that, in general, telework deteriorates individuals' SWB since the outbreak of the pandemic.

Difference in Difference analyses

We next estimate the β_T in Equation (2), that is, the effect of ***the transfer*** from office-based work to telework due to pandemic shock on SWB for potential teleworkers, i.e., respondents who have ever worked from home in either April 2020, September 2020, or January 2021 (that is, completely after the massive switch to home-based work). Table 3 presents estimation results. For employees who hold teleworkable jobs, transfer to telework leads to a significant drop of weekly happiness (-0.320 with P<0.01) and self-evaluated work performance (-0.318 with 0.05≤P<0.10). On the other hand, such switch does not significantly deteriorate mental condition, although a negative effect is detected (-0.250).

Table 3 Catch-all effect of ***switch to*** telework (DiD)

	(1) WH	(2) K6	(3) SP
Treated (T)	-.3202*** (.11353)	-.24987 (.2361)	-.31815** (.12616)
wave18+ (cd)	-.01631 (.08754)	-.51443*** (.16196)	.11744 (.07616)
wave18+×telework-able (cd×twable)	.09943 (.14845)	-.14789 (.27917)	.08206 (.14038)
Observations	4517	4648	4644
R-squared	.02643	.05703	.04432
groups	2004	2015	2013

Robust standard errors are in parentheses. *** p<.01, ** p<.05, * p<.1.
All covariates are controlled.

Table 4 presents the estimates of β_{T18}, β_{T19}, and β_{T20} in Equation (4), that is, the ***respective*** effect of

switch to home-based work in wave 18, wave 19, and wave 20. We detect a substantial and significant drop in affective utility in April 2020 (-0.414 with P<0.01), immediately after the promulgation of the nation-wide SED which exogenously sped up the switch to telework. In wave 19 and 20, during which the SED was not issued or not implemented nationwide, however, the estimates become much smaller and insignificant. On the other hand, we find a negative effect on self-evaluated job performance in both wave 18 and 20, and the estimates in these two waves remain almost the same, despite the fact that SED in January 2021 was far less strict than that in April 2020. Such pattern implies that, the potential mechanisms behind the effect of telework on affective utility and that on subjective productivity might be different.

Table 4 Catch-all effect of *switch to* telework: evolvement (DiD)

	(1) WH	(2) K6	(3) SP
treated in wave 18 (T_{18})	-.41422***	-.3185	-.35184**
	(.13495)	(.28665)	(.14457)
treated in wave 19 (T_{19})	-.1325	-.35438	-.17063
	(.17233)	(.34821)	(.1913)
treated in wave 20 (T_{20})	-.28017	-.02685	-.36678**
	(.175)	(.3479)	(.18624)
wave18+ (cd)	-.02488	-.55413***	.12514
	(.09061)	(.16304)	(.07651)
wave18+×telework-able (cd×twable)	.10027	-.1457	.0822
	(.14859)	(.27914)	(.14039)
Observations	4517	4648	4644
R-squared	.0272	.05731	.04472
group	2004	2015	2013

Robust standard errors are in parentheses. *** p<.01, ** p<.05, * p<.1.
All covariates are controlled.

Discussions

Our finding that working from home is detrimental to employees' SWB is consistent with those in, for instance, Song and Gao (2020), Xiao et al. (2020), Schifano et al. (2021), Senik et al. (2022) and Gueguen

and Senik (2022). According to Chung and Lippe (2020)'s summarization that work-family balance is one of the crucial pathways through which telework might affect SWB, this negative effect might partially indicate that, telework intensifies work-life conflict in Japan, for instance, the blurring of boundaries between household and workplace (Glavin and Schieman, 2012), which could be manifested as the expansion in both working hours and domestic burden (Chung and Lippe, 2020). We will dig into this issue in the next section. In addition, our DiD results that the switch to telework due to the epidemic shock deteriorates happiness and such deteriorated effect was most prominent at the starting phase of Covid-19 while disappeared afterward is consistent with those in Senik et al. (2022) and Gueguen and Senik (2022). Though it could have been interpreted as, based on Gueguen and Senik (2022), individuals emotionally adapted to telecommuting gradually, the transfers to telework in wave 19, around which the SED was not issued, and wave 20, around which the SED was implemented only in restricted areas, are less exogenous than that in wave 18, around which the SED was implemented nation-wide. Hence, we hesitate to claim here that our results support the adaptation hypothesis (Gueguen and Senik, 2022). Nevertheless, our findings do unfold that, telework decreases Japanese employees' SWB, especially immediately after that policy-oriented sudden switch to home-based work.

4.2 Heterogenous effect of telework on subjective well-being

Fixed Effect analyses

Panel (A) of Table 5 presents the estimates of β in Equation (1) by gender. Columns (1)-(2), Columns

(3)-(4), and Columns (5)-(6) displays estimates for happiness, K6, and subjective productivity, respectively. We find that, males suffer more from home-based work. That is, the negative effect of telework is more substantial for males. On the other hand, telework does not significantly decrease females' SWB. Panel (B) shows estimates for husbands and wives (married males and females). Similarly, husbands are found to be more unhappy and mentally stressed, as well as have poorer perceived job performance when telecommuting. Meanwhile, wives' SWB is not significantly decreased during at-home work. Panel (C) presents estimates for unmarried males and females.[12] SWB of both unmarried males and females are not significantly affected by telework.[13]

Table 5 Heterogonous effect of telework (FE)

(A) males (m) and females (f)						
	(1) WH: m	(2) WH: f	(3) K6: m	(4) K6: f	(5) SP: m	(6) SP: f
telework	-.34089***	-.18329	-.5226**	-.16981	-.34022**	-.19175
	(.11956)	(.16579)	(.23273)	(.34321)	(.1344)	(.18403)
Observations	2665	1965	2728	2033	2722	2038
R-squared	.03428	.04117	.05737	.08715	.05652	.05911
groups	1136	912	1138	921	1135	922
(B) husbands (h) and wives (w)						
	(1) WH: h	(2) WH: w	(3) K6: h	(4) K6: w	(5) SP: h	(6) SP: w
telework	-.39792***	-.19586	-.66116**	-.45458	-.39611***	-.13644
	(.12743)	(.19457)	(.25767)	(.44581)	(.15291)	(.24212)
Observations	1998	1269	2049	1320	2045	1327
R-squared	.04215	.05101	.06688	.11588	.06196	.07575
groups	827	597	827	604	826	606
(C) unmarried males (um) and unmarried females (uf)						
	(1) WH: um	(2) WH: uf	(3) K6: um	(4) K6: uf	(5) SP: um	(6) SP: uf
telework	-.08267	-.15576	.20541	.35242	-.07102	-.27349
	(.30382)	(.30464)	(.54753)	(.52121)	(.29448)	(.28497)
Observations	667	696	679	713	677	711
R-squared	.05939	.05262	.07213	.10061	.09273	.10619
groups	313	319	315	321	313	320

Robust standard errors are in parentheses. *** p<.01, ** p<.05, * p<.1. All covariates are controlled.

[12] It should be noted that unmarried individuals include those who are not yet married, and divorced or widowed ones.

[13] Nevertheless, telework is found to insignificantly improve unmarried employees' mental condition.

Difference in Difference analyses

Panel (A) of Table 6 displays the estimates for β_T in Equation (2) for all males and females, which reveals a significant detrimental effect of switch to telework on happiness, mental condition, and subjective productivity of male potential teleworkers. However, no significant effect is detected for females. Panel (B) shows results for husbands and wives. Teleworkable husbands who switch to home-based work are found to be less happy, as well as have worse mental condition and perceived work performance. On the other hand, teleworkable wives' SWB does not significantly fall due to such transfer. Panel (C) provides estimates for unmarried males and females. Interestingly, we find that transfer to telework makes mental condition of unmarried females who hold teleworkable jobs less stressed.

Table 6 Heterogonous effect of *switch to* telework (DiD)

(A) males (m) and females (f)						
	(1) WH: m	(2) WH: f	(3) K6: m	(4) K6: f	(5) SP: m	(6) SP: f
Treated (T)	-.446***	-.10415	-.48251*	.04529	-.38501**	-.19722
	(.13542)	(.19487)	(.26302)	(.44261)	(.15634)	(.21324)
wave18+ (cd)	-.03164	-.00904	-.24906	-.95193***	.07755	.16551
	(.11385)	(.14227)	(.20601)	(.26865)	(.09714)	(.12547)
wave18+×telework-able (cd×twable)	.26943	-.27498	-.13829	-.24097	.14697	.01315
	(.18472)	(.24213)	(.31592)	(.53833)	(.17033)	(.25117)
Observations	2600	1917	2662	1986	2655	1989
R-squared	.04025	.04349	.05736	.09272	.0578	.05703
groups	1112	892	1114	901	1111	902
(B) husbands (h) and wives (w)						
	(1) WH: h	(2) WH: w	(3) K6: h	(4) K6: w	(5) SP: h	(6) SP: w
Treated (T)	-.47954***	-.16604	-.56161**	-.62514	-.39092**	-.23427
	(.14605)	(.23043)	(.2842)	(.5454)	(.17941)	(.2785)
wave18+ (cd)	.01413	-.18902	-.09284	-1.2655***	.08212	-.14757
	(.13519)	(.18016)	(.24156)	(.33435)	(.10931)	(.1553)
wave18+×telework-able (cd×twable)	.21032	-.23217	-.35904	.85636	.09301	.21881
	(.21287)	(.3132)	(.34903)	(.63479)	(.17993)	(.32211)
Observations	1943	1244	1993	1295	1988	1301
R-squared	.04917	.05327	.06842	.12128	.06449	.07492
groups	808	585	808	592	807	594
(C) unmarried males (um) and unmarried females (uf)						
	(1) WH: um	(2) WH: uf	(3) K6: um	(4) K6: uf	(5) SP: um	(6) SP: uf

Treated (T)	-.32416	.00261	-.01039	1.2253*	-.22648	-.11125
	(.34029)	(.35468)	(.68322)	(.71081)	(.30977)	(.3479)
wave18+ (cd)	-.128	.37078	-.69169	-.35399	.09014	.6786***
	(.20565)	(.23528)	(.42124)	(.44882)	(.22322)	(.20931)
wave18+×telework-	.48244	-.30519	.46005	-2.18366**	.20258	-.37889
able (cd×twable)	(.39121)	(.36073)	(.7535)	(.97693)	(.42227)	(.41234)
Observations	657	673	669	691	667	688
R-squared	.06634	.07013	.0744	.12405	.09518	.10968
groups	307	311	309	313	307	312

Robust standard errors are in parentheses. *** p<.01, ** p<.05, * p<.1. All covariates are controlled.

Estimates of β_{T18}, β_{T19}, and β_{T20} in Equation (4) by gender and marital status are provided in Table 7. For teleworkable males who actually switched to telework, their weekly happiness, mental condition and subjective productivity significantly declined in wave 18. While their mental status recovered in wave 19 and 20, happiness and subjective productivity dropped again from wave 19 to 20 after rebounded from wave 18 to 19. SWB of husbands exhibits similar patterns. For females and wives, no significant trends are detected in general. For unmarried ones, single female teleworkers are found to be less mentally stressed in wave 18, while no significant trends exist for single males.

Table 7 Heterogonous effect of *switch to* telework: evolvement (DiD)

(A) males (m) and females (f)						
	(1) WH: m	(2) WH: f	(3) K6: m	(4) K6: f	(5) SP: m	(6) SP: f
treated in wave 18	-.50943***	-.25397	-.70806**	.11318	-.42272**	-.20345
(T_{18})	(.16447)	(.22684)	(.35179)	(.47837)	(.17691)	(.24652)
treated in wave 19	-.30158	.26526	-.43931	-.13372	-.27874	.20804
(T_{19})	(.214)	(.28756)	(.40899)	(.65474)	(.22877)	(.36841)
treated in wave 20	-.45053**	.00501	-.13288	.00429	-.4053*	-.52792
(T_{20})	(.20524)	(.32398)	(.37935)	(.74342)	(.21894)	(.36069)
wave18+ (cd)	-.03243	-.02387	-.32256	-.94618***	.08025	.20812*
	(.11835)	(.14582)	(.21058)	(.2664)	(.09778)	(.12485)
wave18+×telework-	.27227	-.28366	-.12541	-.23881	.1487	.01355
able (cd×twable)	(.18475)	(.24311)	(.31637)	(.53889)	(.16995)	(.25213)
Observations	2600	1917	2662	1986	2655	1989
R-squared	.0407	.04558	.05838	.09283	.05805	.06022
group	1112	892	1114	901	1111	902
(B) husbands (h) and wives (w)						
	(1) WH: h	(2) WH: w	(3) K6: h	(4) K6: w	(5) SP: h	(6) SP: w
treated in wave 18	-.53089***	-.3401	-1.0487***	-.61491	-.40425**	-.12533
(T_{18})	(.18222)	(.25676)	(.38468)	(.56244)	(.20593)	(.30852)
treated in wave 19	-.41082*	.23792	-.24799	-.4925	-.405	.18667
(T_{19})	(.24056)	(.36854)	(.46131)	(.81373)	(.2562)	(.46217)
treated in wave 20	-.45441**	-.05623	-.03428	-.79661	-.35888	-1.01761**

(Γ_{20})	(.21651)	(.38707)	(.41973)	(1.02639)	(.25136)	(.45848)
wave18+ (cd)	.00687	-.2042	-.22284	-1.24447***	.0748	-.05157
	(.1414)	(.1846)	(.24736)	(.32878)	(.11027)	(.15206)
wave18+×telework-able (cd×twable)	.21256	-.23678	-.33395	.85842	.09404	.22812
	(.21318)	(.31467)	(.34922)	(.63599)	(.1795)	(.325)
Observations	1943	1244	1993	1295	1988	1301
R-squared	.04935	.05596	.07214	.12141	.06452	.08486
group	808	585	808	592	807	594

(C) unmarried males (um) and unmarried females (uf)

	(1) WH: um	(2) WH: uf	(3) K6: um	(4) K6: uf	(5) SP: um	(6) SP: uf
treated in wave 18	-.47741	-.10174	.3417	1.39676*	-.37583	-.33824
(Γ_{18})	(.38085)	(.41508)	(.84647)	(.79572)	(.34259)	(.4205)
treated in wave 19	.04753	.44364	-.9103	.73028	.40435	.14748
(Γ_{19})	(.46505)	(.48664)	(.96526)	(.92932)	(.43971)	(.64396)
treated in wave 20	-.24474	.03512	-.2089	1.03126	-.3741	.38457
(Γ_{20})	(.57394)	(.57753)	(.95623)	(.89729)	(.4687)	(.54641)
wave18+ (cd)	-.13601	.37015	-.67155	-.32728	.11319	.60265***
	(.21224)	(.2408)	(.43286)	(.45714)	(.22343)	(.21733)
wave18+×telework-able (cd×twable)	.48944	-.32432	.44544	-2.15926**	.21072	-.40304
	(.39039)	(.36253)	(.75507)	(.98046)	(.42256)	(.41197)
Observations	657	673	669	691	667	688
R-squared	.06903	.07197	.07812	.12478	.10088	.11426
group	307	311	309	313	307	312

Robust standard errors are in parentheses. *** p<.01, ** p<.05, * p<.1. All covariates are controlled.

Discussions

We have found gender discrepancies. Specifically, males, especially married males, are more subjectively vulnerable to change in workplace, while females are less affected. Following work-family balance hypothesis, as concluded in Chung and Lippe (2020), flexible working would produce gendered differences in division of labor, which would lead to gendered discrepancies in well-being. In order to explore such possibilities, we in the next step estimate the effect of telework on time allocation, that is, working hours and chore hours (housework hours plus childcare hours).

We first perform fixed effect analyses. The top panel of Table 8 displays estimates for working hours. As Column (1) shows, teleworkers work roughly 3.4 hours less per week compared to their commuter counterparts in general. Such patterns do not vary that much with gender. By further dividing sample via

marital status, we find that working from home decreases weekly working hours of husbands (-3.1 hours) and unmarried females (-6.0 hours), while does not significantly affect that of wives and unmarried males.

Table 8 Time allocation: FE

(A) weekly working hours							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	all	m	f	h	w	um	uf
telework	-3.3571***	-2.98031***	-3.59595***	-3.07308**	-2.04723	-2.0866	-5.99295***
	(.86725)	(1.13969)	(1.33874)	(1.28104)	(1.70987)	(2.68236)	(2.24062)
Observations	4782	2735	2047	2055	1332	680	715
R-squared	.08125	.10235	.07291	.1116	.08754	.13423	.09262
groups	2063	1139	924	828	606	315	322
(B) weekly chore hours (housework hours + childcare hours)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	all	m	f	h	w	um	uf
telework	1.5773***	1.02307*	2.64775***	1.30725**	3.63012**	-.33604	1.29489
	(.50441)	(.52849)	(1.00976)	(.62469)	(1.50874)	(.76433)	(1.20475)
Observations	4782	2735	2047	2055	1332	680	715
R-squared	.04624	.06644	.06071	.09047	.09031	.04808	.09499
groups	2063	1139	924	828	606	315	322

Robust standard errors are in parentheses. *** p<.01, ** p<.05, * p<.1. All covariates are controlled.

The bottom panel of Table 8 shows estimates for chore hours. Home-based work increases weekly chore time by 95 (≈1.6×60) minutes for all respondents. Both husbands and wives would contribute more to home production if they work from home, while wives contribute much more compared to husbands (3.6 hours for wives versus 1.3 hours for husbands). On the other hand, home-based work does not exert significant effect on chore time of unmarried ones. Nevertheless, we observe an imprecisely estimated increase (decrease) in chore hours for unmarried females (males). To sum up, female teleworkers tend to concentrate more on household demands compared to male teleworkers.

We next examine whether transfer to home-based work affects potential teleworks' time allocation. For simplicity, only estimates on its separate effect throughout wave 18 to 20 are presented. The top and bottom panel of Table 9 displays results for working hours and chore hours, respectively. In general,

switch to telework decreased weekly working hours for all potential teleworkers by 3.79 in wave 18. For teleworkable males and husbands, their weekly working hours contracted by around 4.2 in wave 18, and the corresponding figure for all teleworkable females is 3.1. On the other hand, no significant decline is detected for wives and unmarried individuals. Meanwhile, teleworkable respondents contributed additional 2.1 hours per week to household production in wave 18, and teleworkable females contribute much more (4.0 hours), especially for wives (6.1 hours). On the other hand, additional weekly housework and childcare hours of males, regardless of marital status, and unmarred females is ignorable. Lastly, we find that the estimates in wave 19 and 20 are insignificant, and the absolute values of estimates attenuate from wave 18 to 20 in most cases.

Table 9 Time allocation: DiD

(A) weekly working hours							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	all	m	f	h	w	um	uf
treated in	-3.79485***	-4.20352**	-3.09439*	-4.24752**	-2.3587	-3.9501	-3.83558
wave 18 (T_{18})	(1.30267)	(1.83444)	(1.78659)	(2.12368)	(2.33537)	(3.73641)	(2.87396)
treated in	-1.55643	-.46762	-4.27669	-1.39216	-3.23248	3.1697	-8.21053
wave 19 (T_{19})	(1.61323)	(2.00132)	(2.81218)	(2.38494)	(3.40606)	(2.98964)	(5.6231)
treated in	-.48139	-.55618	-.20639	.14871	-2.20848	-.78259	1.36564
wave 20 (T_{20})	(1.34206)	(1.70482)	(2.33371)	(2.00247)	(2.3724)	(3.11833)	(5.71456)
wave18+ (cd)	-.40518	-1.03808	.46618	-1.93812**	1.01069	1.95206	-.81717
	(.63241)	(.86143)	(.93882)	(.97478)	(1.12041)	(1.79824)	(1.62403)
teleworkable*	-1.4668	-1.12407	-1.45062	-1.29082	-.00433	-.10873	-3.45845
wave18+	(1.13679)	(1.45883)	(1.92604)	(1.7359)	(2.48749)	(2.41637)	(3.21201)
(cd×twable)							
Observations	4666	2668	1998	1998	1306	670	692
R-squared	.08368	.10349	.07688	.11209	.09046	.14036	.09955
group	2019	1115	904	809	594	309	314
(B) weekly chore hours (housework hours + childcare hours)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	all	m	f	h	w	um	uf
treated in	2.05912***	.57514	3.98433***	.86139	6.11281***	-.15054	.62729
wave 18 (T_{18})	(.71089)	(.83556)	(1.26132)	(1.03094)	(1.7864)	(.95542)	(1.52962)
treated in	.2324	.31198	-.1594	-.1689	-.73746	1.21302	2.73526
wave 19 (T_{19})	(.74953)	(.83714)	(1.55111)	(.97237)	(2.06821)	(1.2229)	(2.18965)
treated in	-.07828	.00277	.01729	-.16454	.18771	-.56479	-.7142
wave 20 (T_{20})	(.76614)	(.78376)	(1.8126)	(.93003)	(2.45827)	(.80217)	(2.99068)
wave18+ (cd)	-.00738	-.06226	.25804	-.15115	-.38587	.22344	1.89176
	(.43128)	(.40913)	(.94282)	(.51691)	(1.08395)	(.57062)	(1.80938)
teleworkable*	1.23934**	.90798	2.43408*	1.41514*	2.41174	-.79297	2.272
wave18+	(.62424)	(.69297)	(1.25489)	(.81442)	(1.64487)	(1.18967)	(1.90531)

(cd×twable)							
Observations	4666	2668	1998	1998	1306	670	692
R-squared	.04824	.06631	.07104	.09471	.10883	.05255	.09903
group	2019	1115	904	809	594	309	314

Robust standard errors are in parentheses. *** p<.01, ** p<.05, * p<.1. All covariates are controlled.

We have observed that males, especially husbands, tend to contract their working hours, while only do marginally more chores once working from home. Females, especially wives, on the other hand, tend to expand the domestic sphere, while only slightly reduce their working hours when telecommuting. Although these patterns straightforwardly implies that male teleworkers enjoy more leisure time, while their female counterparts might face more severe multi-tasking, which means that female teleworkers might be less emotionally satisfied, the opposite results are found. We attribute it to the potential effect of the gender norms that males are breadwinners while females are caretakers (Piotrowski et al., 2019, Sato, 2022). The fact that males work less when performing telework might violate the gender expectations towards men, and such break of gender identity would attenuate their subjective well-being affective utility (Akerlof and Kranton, 2000). Meanwhile, we also detected that males' reduced working hours are not used to increase chore hours, which is in line with gender expectation. In other words, the "doing gender" effect (West and Zimmerman, 1987) does exist.[14] Although male teleworkers have more leisure time, which should have increased their perceived well-being, the overall effect of telework is still negative for males. Such pattern implies that, Japanese males may still value their expected gender roles. As for females, the increase in domestic production enables them to better cope with the family demands, which fits the gender roles and would consequently make them more satisfied (Akerlof and Kranton,

[14] Stronger statements argue that, males would use telework to expand their working spheres (e.g., Lott and Chung, 2016). Our estimation, however, does not reveal such pattern.

2000). Meanwhile, we do confess that the increasing domestic burden puts pressure on women. That the combined effect of these two opposite forces results in insignificant negative outcomes in most cases implies that, Japanese females might not prioritise conservative gender expectations compared to males, since otherwise we should have detected some positive outcomes (in other words, the effect from gender identity should have overwhelmed that from work-life interfaces if women lexicographically value gender norms).[15]

At last, although the estimates for unmarried ones are almost insignificant, we also detect the similar patterns as above. Besides the relatively smaller sample size for unmarried respondents, which might lead to imprecise estimates, the insignificant estimates for unmarried sample might also reflect the fact that the gender role, which associates with the intra-household division of labor, might be weaker in absence of marriage. This argument could be partially supported by the phenomenon that Japanese females still tend to abandon full-time jobs or even quit the labor market after marriage in order to concentrate more on domestic affairs, although it became less common since 1990s (Hagiwara, 2012). Hence, the gendered effects could be more obviously detected in married respondents.

5. Conclusion and further discussions

We have investigated the effect of telework on SWB (specifically, happiness, mental stress, and subjective

[15] This argument could be partially supported by the increasing female labor force participation rate in Japan. As summarized in Labor Force Survey (LFS), the employment rate of Japanese females aged 15-64 increased from around 50% in early 1970s to around 70% in 2020 (data source: LFS, Ministry of Internal Affairs and Communications).

productivity) in Japan during the Covid-19 pandemic with an emphasis on the potential gender heterogeneities in telework effect. We found that, telework decreases SWB since the Covid-19 outbreak, while this negative effect is significant only for males, especially married males. Males' working hours are decreased when teleworking, which breaks the gender expectations and would attenuate their affective utility following gender identity theory. Although male teleworkers' leisure time increases, which would improve their SWB, the combined effect is still significantly negative. This implies that, Japanese males might still lexicographically value the conservative gender norms. We also detected that, female teleworkers tend to expand their domestic spheres. This is in line with gender expectations, which would enhance female teleworkers' SWB, and hence partially offset the negative affective effect from the increasing domestic burden. However, the non-positive combined effect implies that females may not value traditional gender norms as much as males do.

It should be noted that, our finding that telework deteriorates employees' SWB does not convey that telework itself is detrimental, since we focus on the Covid-19 period, during which home-based work is abruptly adopted by firms and/or government to inhibit the virus spread, while the corresponding supporting measures are not yet sufficiently arranged at all. Conditional on the fact that most of teleworkers are working from home for the first time because of Covid-19, we could believe that most of teleworkers are not emotionally well-prepared to manage their work-life interfaces under this unprecedented circumstance. From this perspective, one might expect that telework exerts some positive effects on SWB before the Covid-19 shock (e.g., Kazekami (2020)'s finding that teleworkers are more

satisfied compared to commuters in Japan during 2017 to 2018), or after workers get used to this new work schedule (e.g., Gueguen and Senik (2022)'s adaptation hypothesis). Nevertheless, our results do illustrate that the positive effects of telework on workers' SWB should not be naively expected, and mandatory telework for collective objectives may not enhance workers' affective utility. Considering the heterogeneities in telework effect on SWB by gender/marital status (as well as other demographical and/or occupational characteristics), the discretionary telework according to employees' needs is important.

References

[1] Akerlof, G. A., & Kranton, R. E. (2000). Economics and identity. *The Quarterly Journal of Economics*, 115(3), 715-753. https://doi.org/10.1162/003355300554881

[2] Angelucci, M., Angrisani, M., Bennett, D. M., Kapteyn, A., & Schaner, S. G. (2020). Remote work and the heterogeneous impact of COVID-19 on employment and health (No. w27749). National Bureau of Economic Research. https://www.nber.org/papers/w27749

[3] Chung, H., & Van der Lippe, T. (2020). Flexible working, work–life balance, and gender equality: Introduction. *Social Indicators Research*, 151(2), 365-381. https://doi.org/10.1007/s11205-018-2025-x

[4] Clark, A. E., & Lepinteur, A. (2022). Pandemic policy and life satisfaction in Europe. *Review of Income and Wealth*, 68(2), 393-408. https://doi.org/10.1111/roiw.12554

[5] Etheridge, B., Wang, Y., & Tang, L. (2020). Worker productivity during lockdown and working from home: Evidence from self-reports (No. 2020-12). ISER Working Paper Series. https://www.iser.essex.ac.uk/research/publications/working-papers/iser/2020-12

[6] Ferrer-i-Carbonell, A., & Frijters, P. (2004). How important is methodology for the estimates of the determinants of happiness?. *The Economic Journal*, 114(497), 641-659. https://doi.org/10.1111/j.1468-0297.2004.00235.x

[7] Giménez-Nadal, J. I., Molina, J. A., & Velilla, J. (2018). Telework, the timing of work, and instantaneous well-being: Evidence from time use data (No. 11271). IZA Discussion Papers. https://www.iza.org/publications/dp/11271/telework-the-timing-of-work-and-instantaneous-well-

being-evidence-from-time-use-data

[8] Giovanis, E. (2017). Does teleworking affect housework division and improve the well-being of couples?. *International Journal of Happiness and Development*, 3(3), 256-282. https://doi.org/10.1504/IJHD.2017.084076

[9] Glavin, P., & Schieman, S. (2012). Work–family role blurring and work–family conflict: The moderating influence of job resources and job demands. *Work and Occupations*, 39(1), 71-98. https://doi.org/10.1177/0730888411406295

[10] Gueguen, G., & Senik, C. (2022). Adopting telework. The causal impact of working from home on subjective wellbeing. Paris School of Economics Working Paper, N° 2021–65. https://shs.hal.science/halshs-03455306

[11] Hagiwara, R. (2012). Which do you choose, marriage or career?: Econometric analysis using JPSC panel data. *International Journal of Economic Policy Studies*, 7, 114-134. https://doi.org/10.1007/bf03405740

[12] Herrera, J., De las Heras-Rosas, C., Rodríguez-Fernández, M., & Ciruela-Lorenzo, A. M. (2022). Teleworking: The link between worker, family and company. *Systems*, 10(5), 134. https://doi.org/10.3390/systems10050134

[13] Ishii, K., Nakayama, M, & Yamamoto, I. (2021a). Determinants and impacts on income and anxiety of working from home during the early phase of the COVID-19 pandemic in Japan (Koronakashoki no kinkyujitaisengenka niokeru zaitakukimmuno jisshiyoin to shotoku ya fuan nitaisuru eikyo). Japanese Journal of Labour Studies (Nihon rodo kenkyu zasshi), 63(6), 81-98 (in Japanese). https://www.jil.go.jp/institute/zassi/backnumber/2021/06/pdf/081-098.pdf

[14] Ishii, K., Nakayama, M, & Yamamoto, I. (2021b). The potential benefit and feasibility of teleworking during the COVID-19 pandemic: Evidence from the Japanese household panel data analysis (Koronaka deno zaitakukimmu no senzaiteki meritto to teichakukanosei: Panerudeta omochiita kensho). PDRC Discussion Paper DP2021-007 (in Japanese). https://www.pdrc.keio.ac.jp/en/publications/dp/7436/

[15] Kazekami, S. (2020). Mechanisms to improve labor productivity by performing telework. *Telecommunications Policy*, 44(2), 101868. https://doi.org/10.1016/j.telpol.2019.101868

[16] Kurowska, A. (2020). Gendered effects of home-based work on parents' capability to balance work with non-work: Two countries with different models of division of labour compared. *Social Indicators Research*, 151(2), 405-425. https://doi.org/10.1007/s11205-018-2034-9

[17] Lott, Y., & Chung, H. (2016). Gender discrepancies in the outcomes of schedule control on overtime hours and income in Germany. *European Sociological Review*, 32(6), 752-765. https://doi.org/10.1093/esr/jcw032

[18] Lyttelton, T., Zang, E., & Musick, K. (2020). Gender differences in telecommuting and implications for inequality at home and work. Available at SSRN 3645561: https://ssrn.com/abstract=3645561 or http://dx.doi.org/10.2139/ssrn.3645561

[19] Ojala, S., Nätti, J., & Anttila, T. (2014). Informal overtime at home instead of telework: Increase in negative work-family interface. *International Journal of Sociology and Social Policy*, 34(1/2), 69-87. https://doi.org/10.1108/IJSSP-03-2013-0037

[20] Okubo, T. (2022). Telework in the spread of COVID-19. *Information Economics and Policy*, 60, 100987. https://doi.org/10.1016/j.infoecopol.2022.100987

[21] Schifano, S., Clark, A. E., Greiff, S., Vögele, C., & d'Ambrosio, C. (2021). Well-being and working from home during COVID-19. Information Technology & People, (ahead-of-print). https://doi.org/10.1108/ITP-01-2021-0033

[22] Petcu, M. A., Sobolevschi-David, M. I., Anica-Popa, A., Curea, S. C., Motofei, C., & Popescu, A. M. (2021). Multidimensional assessment of job satisfaction in telework conditions. Case study: Romania in the covid-19 pandemic. *Sustainability*, 13(16), 8965. https://doi.org/10.3390/su13168965

[23] Piccitto, G., Liefbroer, A. C., & Emery, T. (2022). Does the survey mode affect the association between subjective well-being and its determinants? An experimental comparison between face-to-face and web mode. *Journal of Happiness Studies*, 23(7), 3441-3461. https://doi.org/10.1007/s10902-022-00553-y

[24] Piotrowski, M., Yoshida, A., Johnson, L., & Wolford, R. (2019). Gender role attitudes: An examination of cohort effects in Japan. *Journal of Marriage and Family*, 81(4), 863-884. https://doi.org/10.1111/jomf.12577

[25] Sato, K. (2022). Who is happier in Japan, a housewife or working wife?. *Journal of Happiness Studies*, 23, 509-533. https://doi.org/10.1007/s10902-021-00411-3

[26] Senik, C., Clark, A. E., d'Ambrosio, C., Lepinteur, A., & Schröder, C. (2022). Teleworking and life satisfaction during COVID-19: The importance of family structure (No. 15715). IZA Discussion Papers. https://covid-19.iza.org/publications/dp15715/

[27] Shams, K., & Kadow, A. (2019). The relationship between subjective well-being and work–life balance among labourers in Pakistan. *Journal of Family and Economic Issues*, 40, 681-690.

https://doi.org/10.1007/s10834-019-09631-5

[28] Song, Y., & Gao, J. (2020). Does telework stress employees out? A study on working at home and subjective well-being for wage/salary workers. *Journal of Happiness Studies*, 21(7), 2649-2668. https://doi.org/10.1007/s10902-019-00196-6

[29] Sullivan, C. (2012). Remote Working and Work-Life Balance. In: Reilly, N., Sirgy, M., Gorman, C. (Eds) *Work and quality of life: Ethical practices in organizations*. International Handbooks of Quality-of-Life book series (pp. 275-290). Springer, Dordrecht. https://doi.org/10.1007/978-94-007-4059-4_15

[30] Taniguchi, H., & Kaufman, G. (2014). Gender role attitudes, troubles talk, and marital satisfaction in Japan. *Journal of Social and Personal Relationships*, 31(7), 975-994. https://doi.org/10.1177/0265407513516559

[31] Tremblay, D. G., Paquet, R., & Najem, E. (2006). Telework: A way to balance work and family or an increase in work-family conflict?. *Canadian Journal of Communication*, 31(3), 715-732. https://doi.org/10.22230/cjc.2006v31n3a1721

[32] Tremblay, D. G., & Thomsin, L. (2012). Telework and mobile working: Analysis of its benefits and drawbacks. *International Journal of Work Innovation*, 1(1), 100-113. https://doi.org/10.1504/IJWI.2012.047995

[33] West, C., & Zimmerman, D. H. (1987). Doing gender. *Gender & Society*, 1(2), 125-151. https://doi.org/10.1177/0891243287001002002

[34] Xiao, Y., Becerik-Gerber, B., Lucas, G., & Roll, S. C. (2021). Impacts of working from home during COVID-19 pandemic on physical and mental well-being of office workstation users. *Journal of*

Occupational and Environmental Medicine, 63(3), 181-190.

https://journals.lww.com/joem/Fulltext/2021/03000/Impacts_of_Working_From_Home_During_COVID_19.2.aspx

Appendix

Table A1 full descriptive statistics

Variable	Mean	Std. Dev.
telework	14.09%	
weekly happiness	5.86	2.29
K6	24.89	4.96
subjective productivity	6.06	1.80
age (ref.: 20<=age<30)		
30<=age<40	21.50%	
40<=age<50	29.32%	
50<=age<60	28.11%	
60<=age<65	11.48%	
education (ref.: junior high school)		
senior high school	34.60%	
junior college	16.82%	
university	33.79%	
graduate school	4.03%	
others	9.12%	
female	49.65%	
married	69.85%	
log monthly income	12.36	0.64
weekly working hours	34.15	17.08
joined union	43.94%	
regular staff	63.38%	
industry (ref.: agriculture)		
fishery and forestry	0.13%	
mining	0.00%	
construction	5.76%	
manufacturing	16.74%	
retail	15.54%	
catering and accommodation	4.05%	
finance and insurance	4.12%	
real estate	1.12%	
transportation	5.89%	
information service	2.71%	
communications	1.95%	
energy	0.79%	
health and welfare	17.21%	
education	6.82%	
other service	10.62%	
public affairs	5.96%	
others	0.14%	
firm size (ref.: <5 staffs)		
5-29 staffs	17.09%	
30-99 staffs	17.97%	
100-499 staffs	21.24%	
>=500 staffs	33.04%	
public sector	6.51%	
living area (ref.: yushuo)		
tohoku	6.03%	
kanto	36.53%	
chubu	17.70%	
kansai	17.04%	
chugoku	5.50%	
shikoku	2.64%	
yushu and okinawa	10.46%	
daily one-way commute minutes	27.82	22.08
weekly chore hours	13.92	17.11
living with people who need care	4.77%	

presence of preschool aged child	11.13%
wave (ref.: Feb. 2020)	
May-June 2020	21.82%
Oct.-Nov. 2020	17.56%
Feb. 2021	27.77%

The sample is: employees aged 20-64 in wave 17-20. Standard deviations for dummies are not shown.