Discussion Paper Series

Work, family life and wellbeing of couples during COVID-19

By

Saki Sugano (Daito Bunka University)

Discussion Paper No. 21-4, October 2021

Institute of Economic Research

Faculty of Economics

大東文化大学

DAITO BUNKA UNIVERSITY

TOKYO, JAPAN 175-8571

Work, family life and wellbeing of couples during COVID-19

By
Saki Sugano (Daito Bunka University)

Discussion Paper No. 21-4
October 2021

大東文化大学経済研究所
175-8571 東京都板橋区高島平 1-9-1

Work, family life and wellbeing of couples during COVID-19

Saki Sugano[1][2]

Abstract

The COVID-19 pandemic has forced people to spend more time at home with their families than ever before. This paper examines whether the changes in people's lifestyles as a result have also changed their life satisfaction. To this effect, I employ nationally representative data from Japan to analyze how the changes in work styles and the burden of increased housework and childcare have affected the wellbeing of people as well as the wellbeing of their spouses. My empirical analysis shows gender differences in the effects of the crisis: Women saw an uneven decline in their life satisfaction in the early stages of the crisis; this was especially true for mothers with small children. While the new work style—that is, working from home—had a positive effect on almost everyone, this effect did not hold true for mothers. Co-working couples are adjusting their working hours and the division of labor between housework and childcare. Importantly, when husbands reduced their working hours, there was a positive impact on the wellbeing of spouses with children.

Keywords: COVID-19 · life satisfaction · housework · childcare · work from home

JEL codes: I31 · J13 · J16

Statement and Declarations:
Conflict of interest: The author declare no competing interest.

[1] Daito Bunka University, Department of Economics, Tokyo, Japan
Email: sugano@ic.daito.ac.jp

[2] **Acknowledgments** This paper is based on data provided by the Cabinet Office, Government of Japan. I would like to thank the Cabinet Office for providing me with the data.

1. Introduction

The pandemic of the novel Coronavirus Disease, or COVID-19 as it is now known, has changed the lives of all people, especially favoring a lifestyle with least physical contact with others to reduce the rate of transmission. Since the spring of 2020, people have responded to this crisis by changing the established routines of the way family members spend their time, the burden of housework and childcare, and work style. How couples in households are coping with the challenge of lifestyle changes together and to the extent how their life style change impact on each other's wellbeing? Despite this monumental period in history, little is known about the full effects of such dramatic and alien lifestyle changes on wellbeing[3].

In this study, I discuss how household are coping with sudden lifestyle change brought about by the pandemic in terms of work, housework and childcare arrangement, and people's wellbeing as well as spouses' wellbeing. In particular I hypothesize that life style change - spread of the work from home style, change in working hours, and increased burden of housework and childcare- have different effects on the wellbeing between fathers and mothers. Most of the recent studies have examined the impact of the COVID-19 pandemic on either employment (Adams-Prassl et al. 2020a; Montenovo et al. 2020) or housework/childcare (Huebener et al. 2021), and its effect on wellbeing or mental health separately (Zamarro & Prados 2021)[4]. However, as Biroli et al. (2021) discusses that the way family members spend their time, the burden of housework and childcare, work style, and household tension have changed simultaneously. Several studies have been showed that women had a significantly lower level of life satisfaction or worse mental health than men in the early stages of the crisis (Adams-Prassl et al. 2020b)[5]. The main reason for this is said that owing to the closure of schools and daycare centers and online lectures, childcare role in households, especially of mothers, have increased[6]. Given that women have had a heavier burden of childcare than men even before this pandemic (Aguiar & Hurst 2007; Schoonbroodt 2018), the increased burden of childrearing may have fallen more heavily on mothers as in several recent

[3] The survey literature about the effects of COVID-19 is in Brodeur et al. (2021a).

[4] See also Huebener et al., (2021); Mangiavacchi et al., (2020); Russell & Sun (2020); Yamamura & Tsutsui (2021a).

[5] See also Belot et al. (2021); Davillas & Jones (2020); De Pedraza et al., (2020); Etheridge & Spantig, (2020); Niedzwiedz et al., (2021).

[6] The other study explain that women are more likely to be worried about economic prospects than men, feel more afraid of infection (Oreffice & Quitana-Domeque, 2021) and loneliness under the lockdown measures, and even worry about domestic violence (Brodeur, et al. 2020b; Brodeur, et al. 2021).

studies (Zamarro & Prados 2021; Yamamura & Tsutsui 2021b). However, it is still unclear whether only mothers have responded to the crisis by adjusting (or reducing) their working hours and, thus, increased their burden overall, or whether parents of both genders have responded equally. Inoue et al. (2021) uses the same data with this study and shows that the possibility of men doing household chores increases by 9.3% when they have one more day of remote work. If the decline in women's wellbeing is due to an increase in domestic and childcare work, it may be mitigated by the way spouses work and the division of roles within the household. The effects of workstyle change and intra-household role change on life satisfaction of couples remains unclear.

I use rich nationally representative data from Japan to estimate how the couples in the household tackle with the lifestyle changes together and how their wellbeing is affected by each other's behavior. The survey was conducted by Cabinet Office, Government of Japan, focusing on the wellbeing, lifestyle and behavior changes during COVID-19. The data include more than 10,000 respondents who report their wellbeing in May, December 2020 and before the COVID-19 each. Although wellbeing before the COVID-19 is retrospective, the level of wellbeing is not that different from other wellbeing statistics conveyed at the same period. The survey also asks for information on changes in the respondents' employment status, working hours, roles of housework and childcare, income, and wellbeing. Using the data that includes similar information about their "partners", how families adjust to new lifestyles under the COVID-19 crisis are identified.

My empirical analysis shows that the new working style have the potential to improve wellbeing among couples, especially fathers and mothers with young children. Our data show that increased housework and childcare responsibilities for fathers are associated with working from home, fewer working hours, having children of elementary school age or younger, and increase in wife's working hours. Although there was a large drop in life satisfaction for both men and women at the early phase of the pandemic, working from home are associated with increased in life satisfaction of male and female, with limited effect on mothers. Moreover, mothers with small children substantially increase their wellbeing when fathers decrease working hour.

There are at least three reasons why it is important to discuss the impact of COVID-19 induced life changes on the wellbeing of couples. In Japan, the birthrate is declining, and one of the reasons is said to be the long working hours. If at least one of the spouses

(usually the husband) works long hours, the burden of child rearing falls on the partner (wife), leading to an environment where it is difficult to have and raise children. If work-from-home becomes more widespread, or if the reduction in working hours causes couples to be more satisfied with their lives, this will indicate that the environment will be more conducive to raising children in the long run in Japan. Second, it will help us to understand the reasons for the decline in women's wellbeing during the COVID-19 pandemic. The suicide rate of women in Japan has increased dramatically during the crisis in Japan (Tanaka & Okamoto 2020). Experts attribute this increase to the worsening economic situation and distress about work, domestic violence, childcare, and nursing may become more serious with time. Third, it is important to understand what can improve the gender imbalance in the burden of domestic work. Japan's gender gap rank is 120th among 156 countries in 2021— lowest among major industrialized economies, according to World Economic Forum. In Japan, women have made remarkable inroads into the labor market in recent years, but the majority of these women workers are working as non-regular part-time employees. They are working under low wages and poor working conditions. Also, there are still many women who stop building their careers and become housewives. The burden of housework and childcare has traditionally been skewed toward women. In this paper, I show whether the imbalance in the division of housework and childcare among couples could be improved by the work environment.

The remainder of this paper is organized as follows. In Section 2, I present the relevant literature. Section 3 describes the data and documents the variable statistics. Section 4 presents an analysis of gender differences in life satisfaction at different time periods. Section 5 presents the main results that focus on the interaction between the husband and wife. Finally, section 6 concludes the paper.

2. Connection to previous studies

The findings in this paper contribute to the emerging literature on the gender impacts of the COVID-19 pandemic. Several studies finds that COVID-19 change the role of housework and childcare between husband and wife. While many papers find the uneven distribution of burden of housework and childcare with heavily on women (Alison et al. 2020; Zamarro & Prados 2021), some points out the crisis makes fathers more responsibility for housework/childcare than previously (Alon, et al. 2020; Farré et

al. 2020, Sevilla & Smith 2020; Alison et al. 2020; Hupkau & Petrongolo 2020; Oreffice and Quintana-Domeque 2020; Reichelt et al. 2020). While many studies have investigated them for men and women separately and see the sex differences, very few studies look at the behavior of couples within the household. Only some studies have focuses on the couple's arrangement in work and housework/childcare (Del Boca et al. 2020; Feng & Savani 2020; Zoch et al. 2020; Sevilla & Smith 2020; Champuaux & Marchetta 2021). Del Boca et al. (2020), which is close to this study, shows more fathers do household chore when their spouse work outside. Unlike Del Boca et al. (2020), which focuses on remote work effect, I examine the effect of not only the introduction of remote work but also the impact of changes in working hours during the crisis. It will bring important policy implication for the problem of long working hours in Japan. In addition, based on the hypothesis that the burden is heavier on women in part-time employment and housewives, I also conducted an analysis by employment status, which has never been analyzed before.

Concerning the effect on well-being, a number of studies found that women's wellbeing or mental health are disproportionally affected by the COVID-19 crisis (for U.S., Adams-Prassl et al. 2020b; for UK, Davillas & Jones 2020; Etheridge & Spantig 2020; Niedzwiedz, 2021; Oreffice & Quintana-Domeque 2021; Proto & Quintana-Domeque 2021). While many studies on wellbeing have shown that, under normal circumstances, women usually tended to have higher life satisfaction than men in many countries (Powdthavee et al. 2015), the COVID-19 disaster has had an uneven effect on women's wellbeing due to school closure and increased housework and childcare burden (for U.S., Zamarro & Prados 2021;for Germany, Huebener et al. 2021; for Japan, Yamamura & Tsutsui 2021b). As for the impact of work style on wellbeing, previous studies have shown that working from home is related to greater job satisfaction (Binder 2016; Wheatley 2017; Reuschke 2019) and decreasing working hours are associated with higher well-being of mothers (Alison et al. 2008; Gash et al. 2012; Lunau et al. 2014; Beham et al. 2019). However, what makes the pandemic different from previous situation is the possibility that remote work, reduction in working hours and increased household and childcare burdens are occurring simultaneously in the household. Yamamura & Tsutsui (2021a) shows that fulltime working mothers with children in primary school are more likely to work remotely than fathers. Parents who work from home during the pandemic have been able to spend more time taking care of their

children at home. Without the hassle of commuting and office routines, couples have gained greater control of their working hours and style, allowing them to meet additional housework and childcare needs. Thus incorporating work from home, the effect of housework and childcare on wellbeing is unclear. Unlike previous literature, which focus on the relationship between work style and wellbeing, the novelty of this paper is the idea that not only changes in one's own work style, but also changes in one's spouse work style and housework/childcare role may affect wellbeing. As far as I know, this is the first paper that incorporates the spouse work style or housework/childcare in the same context to investigate the determinants of wellbeing change during the COVID-19 crisis.

3 Data and descriptive statistics

3.1 Data

I use nationally representative data from the Survey on Changes in Attitudes and Behaviors Resulting from the Effects of the COVID-19 Pandemic (*Shingata koronauirusukansenshō no eikyō-ka ni okeru seikatsu ishiki kōdō no henka ni kansuru chōsa)*[7], conducted by the Cabinet Office, Government of Japan. This survey was conducted online twice, the first wave of which was conducted during the early phase of the pandemic between May 25 and June 5, 2020, and the second wave between December 11 and December 17, 2020. In April and May, when the first state of emergency was declared[8], residents were asked to refrain from going out, although it did not go as far as the lockdown implemented in other countries. For businesses, the government requested the following. With the exception of positions that are necessary to maintain social functions, office work should, in principle, be able to done at home, and even in cases where it is unavoidable to go to work the number of people going to work should be reduced at least 70%. At the time of the first wave survey, it was just after the declaration of the state of emergency was lifted, but to reduce contact with

[7] https://www5.cao.go.jp/keizai2/wellbeing/covid/index.html

[8] In the first declaration of a state of emergency in Japan, the emergency was declared in seven prefectures (Tokyo, Kanagawa, Saitama, Chiba, Osaka, Hyogo, and Fukuoka) on April 7, 2020, and the scope was expanded to the entire country on April 16. Then, on May 14, the state of emergency was lifted in 39 prefectures except for eight prefectures (Tokyo, Kanagawa, Saitama, Chiba, Osaka, Kyoto, and Hyogo), and on May 25, the state of emergency was lifted nationwide for the first time in a month and a half.

people, schools were still closed in some areas[9], and remote work was still requested. In December, at the timing of the second wave survey, although the number of infected people had remained high, the state of emergency had not been declared. School was back to normal, and more people were going to work than in May. It was a time when daily life was slowly returning to normal, albeit temporarily.

The survey includes not only information about respondents' place of residence and socioeconomic status, but also information on whether their working styles, working hour, and the division of roles between housework and childcare have changed because of the pandemic effects. The survey also includes information on change in overall satisfaction with life before and after the outbreak of COVID-19. A total of 10,092 people responded to the first survey and 10,091 responded to the second survey: 5,176 of these responded to the first and second surveys in succession.[10]. The sample size was designed by allocating the same number of respondents equally by gender and by age group (10-year age brackets), and by allocating the sample proportional to the population in seven regions (Hokkaido and Tohoku, Tokyo, metropolitan areas excluding Tokyo, Chubu, Kinki, Chugoku, Shikoku, Kyushu, and Okinawa).

Table 1 presents the descriptive statistics in my empirical analysis: total sample and marriage couple with children under 18 years old. About half of the respondents were women and the other half were men, covering all regions of Japan. About 52% of male respondents in the first wave work full time, and 54% in the second wave. About 25% of the female respondents work full time, 25% of female work part time, and 39 % of female are not working and are not seeking job (housewives) in both Wave 1 and Wave 2. About 20 % of respondents reported having children below the age of 18 in the household. In this analysis, a respondent was considered to have children in the household if he/she answered that he/she lived with a daughter or son under the age of 18. About 87% of 1,075 father and 90% of 1,087 mother reported they have at least one children in elementary school age or younger in Wave 1.

---

[9] According to an NHK survey, 10 prefectures had already reopened as of May 18, 2020 (Aomori, Iwate, Akita, Yamagata, Tottori, Saga, Nagasaki, Kumamoto, Oita, Kagoshima prefectures), 14 prefectures were scheduled to reopen in May (Tochigi, Niigata, Toyama, Yamanashi, Nagano, Shizuoka, Shimane, Yamaguchi, Tokushima, Ehime, Kochi, Fukuoka, Miyazaki, Okinawa prefectures), with 23 prefectures stating they would reopen in earnest from June 1.

[10] According to the published information concerning the targets of the surveys, 10,128 people were surveyed in the first survey, 10,128 people were surveyed in the second survey, and 5,212 people were surveyed in both the first and second rounds, and the above description could be identified by respondents in the data.

In the next subsections, I describe the key variables which give us some background information before the empirical analysis: work, housework or childcare role, and wellbeing. I show descriptive patterns in the data along these dimensions. In section 4, I further formalize this analysis.

Table 1 Summary statistics

	Wave 1				Wave 2			
	Male		Female		Male		Female	
	N	Mean	N	Mean	N	Mean	N	Mean
Employment								
1. Full time	5,031	0.52	5,061	0.25	5,044	0.54	5,047	0.26
2. Part time	5,031	0.10	5,061	0.25	5,044	0.10	5,047	0.25
3. Self-employed etc.	5,031	0.12	5,061	0.07	5,044	0.10	5,047	0.05
4. Break/Unemployed	5,031	0.02	5,061	0.04	5,044	0.02	5,047	0.05
5. Not employed including student	5,031	0.24	5,061	0.39	5,044	0.23	5,047	0.39
Of whom employment = 1,2, or 3								
Work from home	3,734	0.34	2,915	0.22	3,747	0.17	2,788	0.11
Working hour(from pre-COVID)								
1. Not change	3,734	0.44	2,915	0.44	3,747	0.57	2,788	0.55
2. Decrease	3,734	0.47	2,915	0.47	3,747	0.28	2,788	0.32
3. Increase	3,734	0.09	2,915	0.09	3,747	0.15	2,788	0.13
Having children	5,031	0.21	5,061	0.21	5,044	0.20	5,047	0.21
Of whom, *Having children less than elementary school*	1,075	0.87	1,087	0.90	1,016	0.78	1,063	0.79
Of whom, *change in husband role* (from pre-COVID)								
Increase	1,043	0.44	953	0.29	911	0.26	849	0.16
Of whom, *change in wife role* （from pre-COVID）								
Increase	1,043	0.23	953	0.32	911	0.11	849	0.12

3.2 Work from home and Working hours

The biggest change in the workstyle during the COVID-19 crisis is working from home. The questionnaire asks whether respondents experience the following work styles under the pandemic: 1. work from home (almost 100%), 2. work from home (more than 50%) with combined regular attendance, 3. regular attendance but regularly work from home, 4. Generally attend work, but work from home irregularly. I define 1 to 3 as *work from home* because not to see the effect of occasional remote work, but to see the effect of remote work, which has taken root as a new way of working in the COVID-19 crisis.

Approximately 34% of 3,734 working male respondents in Wave 1 reported that they work from home regularly and 17 % of 3,747 working male respondents in Wave 2. Before the crisis, only 5.6% of respondents work from home which can be seen in the Wave 2 survey. This result is in line with other surveys, such as those conducted by the Japan Productive Center[11].

At the same time, workers change their working hours. Their business shrinks owing to social distancing requirements or people who work remotely tended to have shorter working hours (Gupta et al. 2020). The *decrease (increase) in working hours* dummy is defined as a person whose working hours have decreased (increased) by more than 6% from the pre-COVID level for both waves. The proportion of respondents who stated that they had decreased their working hours are 47% of the working men and likewise 47% of working women in May 2020. Compared with pre-COVID era, the percentage of people who worked fewer hours in wave 2 (December 2020) was 28% for men and 32% for women. Fig. 2 shows that, by employment, at the early stage of COVID-19, full-time male workers are more likely to reduce their working hours (46.1%) than full-time female workers (41.3%).

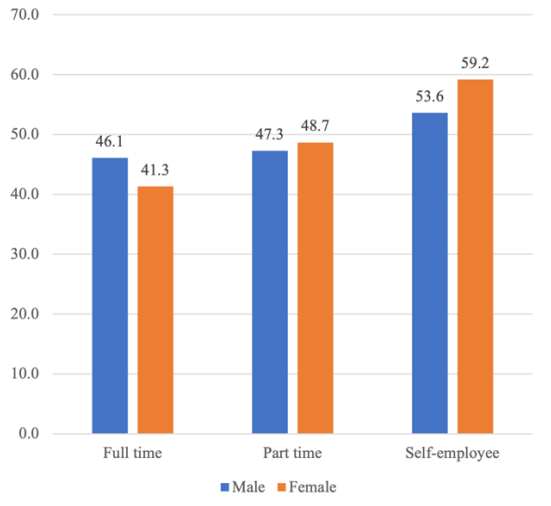


Fig. 2 Percentage of respondents who decreased working hours in May 2020 after COVID-19 spread, by gender and employment status

As shown in Fig 3, a higher proportion of working fathers than working mothers declared having reduced their working hours in May 2020. In December 2020, it was reported that people's working hours had partially recovered and more people answered

[11] https://www.jpc-net.jp/research/assets/pdf/5th_workers_report.pdf

that their working hours were not much different from the pre-COVID-19 period, except for mothers. In December 2020, 33.7 % of the mothers who have less than elementary school age or younger children had still reduced their working hours, contrary 22.8% of fathers. Although I am unable to disentangle whether voluntarily or at the request of their employers, it could affect the allocation of housework and childcare among couple, and their life satisfaction. In section 4, I will further discuss the difference in working hours between couples in the household and its effects on the life satisfaction of each couple.

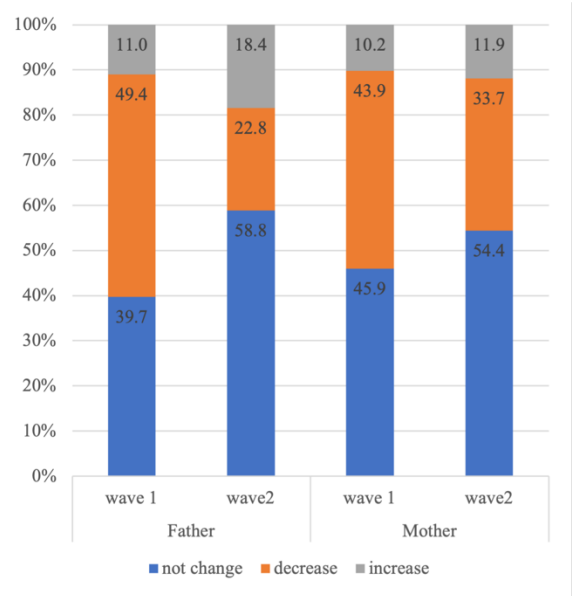


Fig. 3 Percentage of respondents who changed working hours after COVID-19 spread, by father and mother with children of elementary school age or younger

3.3 Housework and childcare

Respondents who reported living with children under 18 years of age are asked about the division of labor between the husband and wife in May and December 2020. In particular, they were asked whether there were *changes* in the allocation of roles for housework and childcare between spouses because of the effects of the COVID-19 pandemic. Respondents could choose one of the following options: 1. The husband's role increased; 2. The husband's role increased slightly; 3. The wife's role increased; 4. The wife's role increased slightly to; 5. Both the husband and wife's roles increased; 6. Both the husband and wife's roles decreased; and 7. No change. I then created an indicator of the division of roles between the father and mother: *the husband(wife) role*

increased dummy takes a value of one if a respondent indicated 1, 2, or 5; otherwise zero. Similarly, *the mother's role increased dummy* takes a value one if the respondent indicated 3, 4, and 5; zero, otherwise. Option 5 was also included in the respective *increased dummy* because the absence of school may have increased the burden of housework and childcare for both fathers and mothers at the same time.

Table 1. Descriptive statistics presents the percentage of respondents who reported that either the role of the husband or wife increased in May and December 2020 compared with pre-COVID-19. Around 44% of fathers declared that they have increased housework and childcare role, and 32% of mothers declared that they have increased their role in wave 1. In December, still high percentage, 26%, of fathers reported that they have increased in their role compared to pre-COVID-19, 12% of mothers reported so. This result can be attributed to school closures across Japan in the first wave, which forced parents to home schooling for their children and prepare their meals. At the same time, fathers have more time for housework and childcare owing to reduced working hours in May, as we saw in section 3.2.

To further explore the determinants of changes in housework and childcare roles during COVID-19, I use wave 1 data which was surveyed in the early stage of COVID-19, that is the timing when severe stay-at-home measurements are taken, and estimate the models with the following probit model specifications:

$$\begin{aligned} &Pr(husband\ role\ increase_{it} = 1|X) \\ &= F(\beta_0 + \beta X_{it} + \mu_1 Work\ from\ home_{it} + \mu_2 Decreasing\ working\ hours_{it} \\ &+ \mu_3 Increasing\ working\ hours_{it} + \mu_4 SP\_Work\ from\ home_{it} \\ &+ \mu_5 SP\_Decreasing\ working\ hours_{it} + \mu_6 SP\_\ Increasing\ working\ hours_{it}) \end{aligned} \quad (1)$$

t = 1

The dependent variable *husband role increase*$_{it}$ can take the value of one if a respondent answered "Compared with pre-COVID-19 crisis, husband has increased his role of housework and childcare" or "Compared with pre-COVID-19 crisis, both husband and wife have increased their role of housework and childcare." The *change* in the division of housework and childcare could be associated with *changes* in working style or working hours for both husbands and wives. A variable *work from home* is the *change* of work styles. *work from home* takes a value one if respondents work from home at time and takes a value zero if work outside at time *t*. For the change in the respondent's

own work during the pandemic, I also included the changes in the respondent's own working hours. *Decreasing (Increasing) working hours*$_{it}$ is an indicator that takes a value of one if the working hours are decreased by more than 6 %, compared with the pre-pandemic. The question asks whether there have been any "changes" in the way your spouse works compared to last December (before the spread of COVID-19), and respondents could select all that apply. Variables marked with SP represent those of their spouses. I include fourteen dummies for respondent's age group of four years (less than 19, 20–24, …, 75–79, more than 80) , six dummies for respondents' educational background (junior high school, high school, vocational school, university, or graduate school), five dummies for respondents' employment status (full-time worker, part-time worker, self-employed, break or unemployed, and unemployed including student), and three household income categories (less than 2 million yen, more than 2 but less than 6 million yen, or more than 6 million yen) and the prefecture dummy.

The main coefficients of interest are those for changes in men's work styles and changes in their spouses' work styles. Table 2 presents the estimated marginal effects of the probit model for the probability of a respondent declaring that husbands have increased in their housework and childcare roles during the COVID-19 crisis. I also estimate the same model (1) by separating for spouse employment status since the household work arrangement could varies with spouse (wives') employment. The results in column (1) show the results for men who answered that husbands had increased their role after the COVID-19 crisis. It was found that fathers who started to work from home presented a 58% higher probability of increasing their role in housework and childcare. Fathers who work from home can allocate their additional time at home to housework and childcare. Fathers who work fewer hours than they did before COVID spread are 74 percent more likely to participate in housework and childcare. If their wives work full time, fathers are increasing their roles, regardless of whether working hours increase or decrease, but the probability of this increasing is greater if working hours decrease. More importantly, when wives' working hours increased from pre-COVID levels, husbands were 73 percent more likely to increase role in housework and childcare. In addition, if they have children in elementary school age or younger, they also increase their role in housework and childcare by 30%. Fathers do increase their share of housework and childcare because they are able to work from home, their working hours decreased, their children are the age to be taken care of, or spouse working hour increased.

Table 2 Probability of husband increase in role of housework and childcare during the pandemic (marginal effect)

	Dep. var = Probability (husband role increase = 1)				
	Fathers				
	All	Spouse working full-time job	Spouse working part-time job	Spouse working as self-employee	Spouse are housewives
	(1)	(2)	(3)	(4)	(5)
change of own workstyle before COVID-19					
Work from home	0.58***	0.91***	0.45**	0.23	0.67***
	[4.72]	[4.06]	[2.37]	[0.33]	[2.73]
decreasing working hours	0.74***	0.74***	0.61***	2.10***	0.92***
	[6.23]	[3.42]	[3.34]	[3.29]	[4.01]
increasing working hours	0.44**	0.87***	0.06	0.09	0.43
	[2.34]	[2.73]	[0.18]	[0.09]	[1.14]
change of spouse workstyle before COVID-19					
Work from home	0.26	0.22	0.24	-0.13	
	[1.62]	[0.89]	[0.79]	[-0.14]	
decreasing working hours	0.22*	0.17	0.36**	-0.74	
	[1.82]	[0.71]	[2.00]	[-0.92]	
increasing working hours	0.73***	0.26	0.76*		
	[2.81]	[0.48]	[1.93]		
Children in elementary school or younger	0.30*	-0.18	0.63**	0.80	0.51
	[1.67]	[-0.45]	[2.43]	[0.86]	[1.16]
Observations	709	253	323	62	239

z-statistics in brackets

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

Education, household income, age, prefecture of residence controls included.

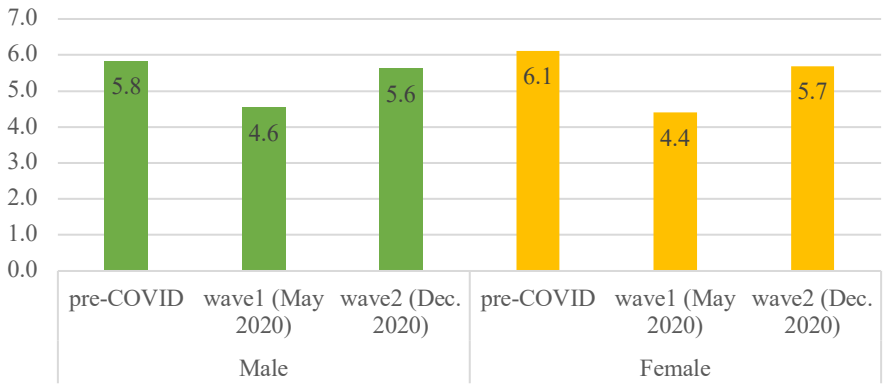
3.4 Wellbeing

By looking at life satisfaction, we can understand how couples' wellbeing are changed with lifestyle changes brought about by COVID-19, such as changes in the work

environment, including work from home and working hour, and changes in the division of roles, such as childcare and housework.

All respondents were asked about their satisfaction with life. In the first wave of data conducted between May and June 2020, respondents were asked "If the overall level of satisfaction or dissatisfaction with your life as a whole is assigned 0 points for 'not at all satisfied' or 10 points for 'very satisfied[12],' what do you think would be the respective scores for (1) life before the pandemic and (2) life now, under the effects of the pandemic." (1) asked retrospective questions about life before the pandemic. The same question with (2) was asked in the second wave in December 2020: "How many points would you give your life today?" One advantage of this survey is that we can compare the situation before the pandemic's spread, the situation at the time of the first survey between May and June 2020, and the time of the second survey in December 2020. In order to compensate for the limitation of the retrospective question, I also conduct a similar analysis using comparable data in the appendix.

Figure 4 shows the wellbeing of men and women in May 2020; December 2020; and the pre-COVID time, which was taken in retrospect in the first wave. In May 2020, when the COVID-19 infection was widespread throughout Japan and first declaration of emergency was just lifted, men's average score was dropped by 22 % and women's average score was dropped by 28 % compared with pre-COVID-19 crisis. In December 2020, men's scores recovered to 5.6 points and women's scores recovered to 5.7 points. The gaps in wellbeing between men and women are significant at the 5% significance level in May but December 2020.



[12] In the original data that the author received from the Cabinet Office and in the analysis, all wellbeing values were converted to plus one to avoid a value of zero. Thus, the maximum value of life satisfaction takes eleven and the minimum value takes one in the analysis.

Fig. 1 Life satisfaction (0–10) before and during the COVID-19 pandemic

4. Gender differences in life satisfaction before and during the COVID-19 pandemic

In this section, I present the method of analysis to further study gender differences, especially between married couples, in change of life satisfaction before, at the peak of the initial phase, and the middle phase of COVID-19. Unlike previous studies which mainly focus on the initial phase of the crisis in the spring of 2020, this study looks at both life satisfaction change in May when the initial infection is exploding and there is the strongest stay-home order restriction, and in December at the point when the restriction becomes milder.

4.1 Methods

I used rich nationally representative data before and during the COVID-19 survey at three different times: one before the crisis; and two points during the crisis, in wave 1(May–June 2020) and wave 2 (December 2020) of data. An estimation is done using three periods of pooled data with the following OLS model specification:

$$\Delta wellbeing_{it} = \beta_0 + \beta_1 Female\ dummy_i + \beta_2 employment_{it} + \boldsymbol{X'_i}\beta + \varepsilon_{it} \quad (2)$$

$t = 1, 2$

The dependent variable is $\Delta wellbeing_{it} = wellbeing_{it} - wellbeing_{i,before}$ (t represent wave 1 and wave 2). $wellbeing_{it}$ takes a numerical value on a 10-point scale, with higher values indicating greater satisfaction with life. $wellbeing_{i,before}$ is the level of life satisfaction in pre-COVID era. For wave 2 as well as wave 1, I use the difference from pre-COVID-19 level by utilizing 5,176 respondents who answer to the first and second surveys in succession because respondents in wave 2 are not asked about the level of satisfaction before the COVID-19 spread. The control variables are the same as in Equation (1). In order to remove the influence of the degree of concern about infection itself on wellbeing, a prefecture-specific dummy was included. The number of newly infected people with COVID19 varied greatly from prefecture to prefecture, and the

more populated a city was, the more people were infected, due to the characteristics of the virus that is transmitted from person to person.

The main coefficients of interest here are those for a female dummy. The parameter β_1 captures the gender difference in wellbeing in May 2020 and December 2020 under COVID-19 relative to the pre-COVID-19 period. Moreover, I estimate separate models for parents with children under age 18 and parents with less than elementary school children. These coefficients could show us how much people's life satisfaction has changed in the COVID-19 disaster compared with the pre-COVID-19 period in May and December, respectively, whether there are gender differences, and whether parents with children and those without children are affected differently.

4.2 Result

Table 2 shows the coefficients of the OLS models for the determinants of change of life satisfaction before the pre-COVID level to the early stage, and the middle stage of the crisis. Column (1) reports the results for general life satisfaction for all respondents with controls, column (2) for parents with children under 18 years old, column (3) for parents with elementary school children or younger. Column (4)-(6) show the results for middle stage of the crisis in December 2020 in wave 2 data.

Compared with the pre-COVID-19 period, women experienced a statistically significant decrease in life satisfaction compared with men, especially in May. Mothers' subjective wellbeing was even lower; the gender difference showed that it was statistically and significantly lower than fathers'. This result conforms to the literature that have been showed that women had a significantly lower level of life satisfaction or worse mental health than men in the early stages of the crisis (Adams-Prassl et al, 2020b; Niedzwiedz et al., 2021). In Japan, at the time of the first survey, from the end of May to the beginning of June, many people were still staying home and their lives were very different from a few months ago. Schools had not started to reopen in some areas, and the situation must have been stressful for parents with small children. Even though the school closure had lifted in some area, they were also in the midst of fear of infection of their children as well as themselves. Mothers are often responsible for caring for their children. Therefore, it is not surprising that mothers are less satisfied with their lives than fathers in the Japanese study in the school closed time. By December, the gender difference in wellbeing was no longer statistically significant for parents. As shown in Fig. 1, comparing May and December, we can see an improvement

in life satisfaction. Compared with the May survey, when the second wave was conducted in December 2020, people were getting used to the new lifestyle, and the number of new infections was still high but stable, leading to less concern about infection and increased parental burden owing to school closure. Overall, all these models show that women have experienced lower life satisfaction during the early stage of the COVID-19 crisis than men, and this is especially true for mothers with small children who need to be cared for by adults.

To address the limitation of the data that we have only retrospective information on wellbeing before the COVID-19 crisis, I use supplementary data from the Wellbeing Survey and Quality of Life (WSQL) (*Manzokudo, Seikatsu no sitsu ni kannsuru chōsa*) [13] for the life satisfaction before the crisis. In the Appendix Table A3, the results of estimation of Ordered logit model using WSQL, wave 1 and wave 2 of the data in this study show that women statistically and significantly decrease their wellbeing in May 2020, compared with men in May, but this gender difference diminished in December for parents.

[13] https://www5.cao.go.jp/keizai2/wellbeing/manzoku/index.html

Table 2 Gender differences in life satisfaction before and during the COVID-19 pandemic

	Dep. var = wellbeing change (wellbeing in wave t - wellbeing before COVID)					
	Wave 1 (early phase of COVID19)			Wave 2 (middle phase of COVID19)		
	All	parents	Parents with children in elementary school or younger	All	parents	Parents with children in elementary school or younger
	(1)	(2)	(3)	(4)	(5)	(6)
Female dummy	-0.35***	-0.44***	-0.44***	-0.15*	0.07	0.09
	[-6.15]	[-3.06]	[-2.87]	[-1.75]	[0.29]	[0.34]
Part time	-0.14*	-0.20	-0.18	-0.14	-0.60**	-0.43
	[-1.90]	[-1.15]	[-0.94]	[-1.26]	[-2.01]	[-1.25]
Self-employ etc.	-0.12	-0.59***	-0.51**	-0.18	0.04	-0.35
	[-1.29]	[-2.99]	[-2.34]	[-1.22]	[0.11]	[-0.83]
Break/Unemployed	-0.24	-0.72**	-0.86**	-0.51**	-0.75*	-0.71
	[-1.63]	[-2.14]	[-2.41]	[-2.48]	[-1.85]	[-1.63]
Not employed including student	-0.34***	-0.33*	-0.32	-0.12	-0.69**	-0.63*
	[-4.06]	[-1.77]	[-1.62]	[-0.99]	[-2.31]	[-1.87]
Observations	9,057	2,154	1,900	4,808	1,122	877
R-squared	0.03	0.06	0.06	0.02	0.05	0.07

t-statistics in brackets
*** p<0.01, ** p<0.05, * p<0.1
Education, household income, age, prefecture of residence controls included.

5 Main Analysis: Spouse's lifestyle changes matter for wellbeing

In this section, I explore the factors that define couple's wellbeing during the pandemic. In particular, I focus on changes in women's own work style, as well as, changes in the work style and lifestyle of their spouses brought about by the pandemic. Owing to requests to stay home and school closures, the burden of housework and childcare has increased. At the same time, some people needed to take a temporary leave from work or reduced working hours owing to scaling down business activities. Other people are in occupations that allow them to work from home, and some are in occupations that increase their working hours. How they dealt with or shared the increased burden of housework and childcare would have been adjusted according to the working style and working hours of the couple in each household. If the burden of these works affects life satisfaction and if there are changes in work and the role of housework and childcare

between husbands and wives owing to this pandemic, then the way a spouse works and shares housework and childcare would affect that person's life satisfaction. Therefore, I examine the impact of changes in working hours and working style of a person and their spouse on life satisfaction.

5.1 Estimation strategy

To study how couples' life satisfaction, especially that of women, in the household are affected by changes in each other's workstyle and division of household responsibilities during the COVID-19 crisis, I used the information that included changes in the way respondents and their spouses' work and division of housework and childcare between respondents and their spouses compared with before the pandemic. In addition to that, the data includes level of wellbeing before the pandemic. Although the questions are retrospective, supplemental data demonstrated validity in the appendix.

Some may concern that it may have a self-selection problem about work from home and working hour decision. Simply regressing the value of wellbeing on remote work and working hours may bring biased estimation if there is common unobservable characteristics to determine both remote work or working hours and the level of wellbeing . Therefore, in this paper, I regress the *"change"* in wellbeing on the *"change"* in working style, working hours, and role. This is the similar to the first-difference estimation method and remove an omitted variable bias which might occurred due to the time-invariant unobserved individual characteristics. Unlike normal days, they are asked to do work from home or change their working hours by their company or the government rather than choosing to do so of their own volition under the COVID-19 pandemic, and because of the fact that most people did not work from home before, whether they work from home or not and whether they decrease (increase) in their working hours is considered to be a change that occurred exogenously in a sense as in Möhring et al. (2021). As for the spouse's work style, the survey asked about the *"change"* compared with before the pandemic. It is possible to estimate straightforward how the *"change"* in workstyle affected the change in wellbeing. For the employees, whether work from home or not and whether they reduce (raise) their working hour are not kinds of self-selection under the emergency. Even the self-selection of spouse work from home decision are rather not possible, and therefore, unobserved heterogeneity to select-in to make spouse work from home is unlikely in this situation.

As these questions are for respondents who have children under 18 years of age at home, this analysis is limited to families with children. I focused on the early stages of the spread of infectious diseases, when changes were significant, and estimate the following OLS model:

$$\begin{aligned}\Delta Wellbeing_{it} = \beta_0 + \boldsymbol{X}'\boldsymbol{\beta} + \mu_1 Work\ from\ home_{it} + \mu_2 Decreasing\ working\ hours_{it} \\ + \mu_3 Increasing\ working\ hours_{it} + \mu_4 SP\ Work\ from\ home_{it} \\ + \mu_5 SP\ Decreasing\ working\ hours_{it} + \mu_6 SP\ Increasing\ working\ hours_{it} \\ + \delta_1 husband\ role\ increase_{it} + \delta_2 wife\ role\ increase_{it} + \Delta\varepsilon_i\end{aligned} \quad (3)$$

$t = 1$

The dependent variable is $\triangle wellbeing_{it} = wellbeing_t - wellbeing_{i,before}$. I estimate the impact of the *"changes"* in own and spouse work styles and roles on the *"changes"* in life satisfaction. The control variables **X***it* include employment status, education levels, household income, age groups, and prefecture defined in equation (1) above. The penetration of work from home and *change* in working hours were the most significant *changes* in the way we worked during the pandemic. The respondents were also asked whether there had been any *change* in the division of roles between spouses in housework and childcare compared with the time before the spread of the infection. I estimate a model separately for the respondents who do not have children, who have children, whose children are in elementary school or younger, given that children of that age need more help from their parents and whose children are more than junior high school age or older. These estimated coefficients would help us understand the important factors of women's life satisfaction and how they are influenced by their spouses.

5.2 Results

Table 3 shows the results of the analysis outlined in equation (2) using the data of wave 1 survey. Columns (1) and (2) report the results for life satisfaction of male and female with control variables of change of own working style. Since only those who have children under 18 years old are asks about spouse work style and housework and childcare role, the overall estimation does not include those variables. Column (3)-(8) shows the results of fathers and mothers with control variables of own and spouse

working environment changes and division of housework and childcare change among couples after facing the COVID-19 crisis. Columns (3) and (4) shows the parents with children. Columns (5) and (6) report results for fathers and mothers with children of elementary school age or younger. Columns (7) and (8) report results for fathers and mothers with children but no children younger than elementary school age. Generally, working from home statistically significantly increases people's wellbeing as in Column (1) and (2). Especially, fathers with children under 18 years old who work from home have more satisfied with life but we can see limited effect on mother. Appendix 4 which analyze by ordered logit model support the results. Interestingly, as shown in columns (3) and (5), fathers in households with children have increased life satisfaction by engaging more in housework and childcare during the crisis. The fathers with small children were definitely improving their wellbeing by working from home and increasing their role in household chores and childcare. Moreover, for mothers, I find that wellbeing is affected by husband' way of work. Mothers', especially with small children, life satisfaction increased when their spouses decreased their working hour during this crisis compared with pre-COVID. This result is also supported by ordered logit model as seen in the Appendix Table A4. For mothers with small children who need much care, the longer working hours of their husbands means that they cannot share the load as much. The fact that this has a positive impact on the wellbeing of not the fathers themselves, but also spouses, shows that improving the long working hours of fathers, which is one of the problems in the Japanese work environment, is an important policy issue. As seen in the Table A4, in ordered logit model, the decrease in the role of wives also positively affected the wellbeing of mothers with small children. Spending time at home together, and the increase in the father's share of housework and childcare and the decrease in the mother's share are associated with an increase in the satisfaction of both parties with small children. The effect on the satisfaction for mothers without children of elementary school or younger cannot be explained by a change of workstyle, working hours and role allocation.

Table 3 Change in life satisfaction of the father and mother, and the change in their work and role in the household at the early phase of the COVID-19 crisis

	Dep. var = wellbeing change (wellbeing in May - wellbeing before COVID)

	No children		With children		With children in elementary school or younger		Without children in elementary school or younger	
	Men	Women	Father	Mother	Father	Mother	Father	Mother
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Work from home	0.34***	0.68***	0.39*	0.41	0.47**	0.52*	0.36	-2.71
	[3.29]	[4.81]	[1.81]	[1.41]	[1.99]	[1.72]	[0.43]	[-0.95]
decreasing working hours	-0.24**	-0.19	-0.07	0.01	0.04	-0.04	-1.08*	1.18
	[-2.47]	[-1.58]	[-0.34]	[0.03]	[0.18]	[-0.15]	[-1.83]	[1.07]
increasing working hours	0.05	-0.19	0.20	0.30	0.23	0.44	-0.83	0.59
	[0.30]	[-0.93]	[0.62]	[0.82]	[0.66]	[1.14]	[-0.70]	[0.23]
SP_Work from home			-0.11	-0.01	-0.14	-0.03	0.34	1.79
			[-0.42]	[-0.05]	[-0.48]	[-0.10]	[0.35]	[1.23]
SP_decreasing working hours			-0.26	0.43*	-0.29	0.48*	-0.27	-0.77
			[-1.24]	[1.71]	[-1.22]	[1.76]	[-0.35]	[-0.59]
SP_increasing working hours			-0.28	-0.27	-0.41	-0.45	2.14	2.16
			[-0.64]	[-0.41]	[-0.81]	[-0.60]	[1.61]	[0.87]
Husband role increase			0.50**	0.02	0.65***	0.05	-0.30	-1.53
			[2.56]	[0.08]	[2.97]	[0.21]	[-0.42]	[-1.02]
Wife role increase			0.03	-0.06	0.14	-0.06	-0.99	-0.06
			[0.13]	[-0.28]	[0.55]	[-0.25]	[-1.15]	[-0.04]
Observations	2,678	2,201	725	597	626	535	99	62
R-squared	0.04	0.04	0.12	0.12	0.13	0.13	0.53	0.65

t-statistics in brackets
*** p<0.01, ** p<0.05, * p<0.1
The sample is made up of working mothers and fathers whose partners are also working as fulltime employee, parttime employee or self-employed in the surveyed time.
Coefficient estimates from OLS regression.
Education, household income, age, prefecture of residence controls included.

Next Table 4 shows the results of the analysis that I estimate separate models for mothers of each employment. In recent years in Japan, more women are participating in the workforce and the percentage has reached a record high. However many women are taking part-time jobs which offer flexibility, but no promotion. In the data in this study, among 1,087 female respondents with children in the household, 30% are in part-time position, compared with 2.6% for men. Women in full-time job make up 28% of the respondents with children, compared with 89% of men. Also, high proportion (30%) of female respondents with children are not working and not seeking jobs (housewives), compared with 1% of fathers. While those with non-full-time employment could have more flexibility or shorter working hours to raise children, they are at disadvantage for highly educated female workers into productive position. Therefore, it is important to look at the impact of different employment positions in terms of policy.

Table 4 shows the estimated results by mother's employment as above using wave 1. Column (1) find that reducing the working hours of spouse (fathers) is particularly important for the wellbeing of mothers who work full-time jobs. Interestingly, at the early stage of COVID-19 crisis when schools are still closed in some areas, wellbeing of housewife has declined as their roles in housework and childcare have increased as in Column (5). This can be pointed out as the possibility that the increased sharing of housework and childcare due to the school closure and husbands being at home during this period may have weighed particularly heavily on housewives. Perhaps dual-earner couples, especially full-time job couples, arranged the increased sharing of workload between the two of them, but housewives may have had to bear the increased workload on their own. Life satisfaction of mothers in other employment cannot explain by the work style change or role change. Those with non-full-time employment may be less affected by their spouse's work style than those who work full-time, because their hours are more flexible to cope with the increased burden of housework and childcare.

Table 4 Change in life satisfaction of the mother, and the change in their work and role in the household at the early phase of the COVID-19 crisis by employment

	Dep. var = wellbeing change (wellbeing in May - wellbeing before COVID)				
	Mother				
	Full-time	Part-time	Self-employee	Break/Unemployed	Not employed
	(1)	(2)	(3)	(4)	(5)
Work from home	0.14	0.30	1.17		
	[0.28]	[0.58]	[0.76]		
decreasing working hours	0.31	-0.08	-0.45		
	[0.75]	[-0.22]	[-0.24]		
increasing working hours	-0.24	0.25	2.95		
	[-0.37]	[0.48]	[1.01]		
SP_Work from home	0.16	-0.11	2.96	2.70	0.18
	[0.36]	[-0.26]	[0.62]	[0.52]	[0.42]
SP_decreasing working hours	1.18**	-0.26	3.10	2.66	-0.34
	[2.44]	[-0.70]	[1.52]	[0.98]	[-0.90]
SP_increasing working hours	0.29	-0.22	-3.30	-9.96	-0.38
	[0.19]	[-0.25]	[-1.04]	[-2.16]	[-0.43]
Husband role increase	0.32	-0.35	0.08	6.21	-0.52
	[0.84]	[-0.91]	[0.02]	[1.95]	[-1.30]
Wife role increase	-0.24	0.11	-0.72	4.73	-1.23***
	[-0.59]	[0.31]	[-0.38]	[1.54]	[-3.35]
Observations	246	290	61	39	277
R-squared	0.24	0.23	0.88	0.99	0.26

t-statistics in brackets

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

Education, household income, age, prefecture of residence controls included.

6. Conclusion

The COVID-19 pandemic has changed the way people live around the world, with more time being spent at home with families. I examined how family members' lifestyles have changed and how these changes affect other family members' wellbeing. Although there exists emerging literature on gender differences in employment, childcare arrangements, and mental health during the pandemic, to the best of my knowledge, few studies have focused on the interaction of husbands and wives' lifestyle change and

partners' wellbeing. As husbands and wives spend more time together at home during this pandemic, they are more likely to affect each other, unlike ever before.

To begin with, the study examined how the division of housework and childcare was coordinated between couples. Fathers are more likely to do housework and childcare if they work remotely, if their working hours decrease, if their children are in elementary school or younger, and if their spouse's working hours increase. My empirical results support the similar results as related literature. Del Boca et al. (2020) shows that men are more likely to devote household chores when their wives are working at their usual workplace. Sevilla and Smith (2020) also find additional childcare done by father when they are furlonged/ not working. In my analysis, father's probability of increase in housework and child care role increases by 58% if they work from home, 74% if they reduce working hours and by 73% if their spouse increase working hours in the early stage of the crisis.

Next, by using wellbeing data at three time points (one pre-COVID-19 and two after COVID-19), I show there was a large drop in life satisfaction for both men and women in May. As with most previous studies, the decline was statistically significantly larger for women. There was a recovery to the pre-COVID-19 level at the medium-stage in December.

Third, focusing at the early stage of the crisis, I find that a couple's wellbeing is influenced by their own work style, spouse's work style and contribution to household chores. Generally, working from home statistically significantly increases people's wellbeing. Especially, fathers with children under 18 years old who work from home have more satisfied with life than men without children. Moreover, fathers with small children were more satisfied when increasing their own share of housework and childcare. Previous research has shown that the burden of housework and childcare can worsen the mental health of mothers or feel it difficult to balance work and family (Del Boca et al. 2020), but to my knowledge, it has not been found to have a positive effect on fathers. The results suggest that the exogenous increase in time spent at home due to stay-home orders and remote work (called "supply side shocks" by Sevilla and Smith 2020) has allowed fathers who would have liked to do more housework and childcare but could not due to time constraints to take charge during the COVID-19.

Finally, this study shows on the effect of spousal lifestyle change that mothers with small children substantially increase their wellbeing when fathers decrease

working hour. This is especially true for full-time working mothers. This result is an important finding in Japan, where long working hours have become a problem as a contributing factor to the declining birthrate. In Italy, Del Boca et al. (2020) highlighted the advantages of partners' working from home that generate better work-life balance for women. Although they do not focus on working hours, their results are consistent with mine in that more time spent at home by fathers has a positive impact on the wellbeing of their wives.

The limitation of this study is that only those in households with children were queried about their spouses' work style and division of household work and child-rearing roles. Expanding the survey to all respondents will allow us to compare the effect of households with children with households without children. Also, for the estimation strategy, I assume that the unobserved variable that is common to changes in work style and wellbeing to be a time-invariant, but if it is a time variant, it should be noted that the estimation results may be overstated.

Although there are such limitation, this paper shows that remote work and reduction of men's working hours are recommended from the viewpoint of family wellbeing in Japan. Whether the modified division of labor between couples under a new working style will be sustained long after the pandemic will be the subject of future research.

Appendix 1.

The limitation of the data is that we have only retrospective information on wellbeing before the COVID-19 crisis. To make the analysis more reliable, I use supplementary data from the Wellbeing Survey and Quality of Life (WSQL) (*Manzokudo, Seikatsu no sitsu ni kannsuru chōsa*) [14], again conducted by the Cabinet Office, Government of Japan. WSQL and the data in this study are comparable because both were conducted by the Cabinet Office online with the same question and similar respondent sampling methods. An interview was conducted with about 10,293 individuals between January 25 and February 7, 2019, and an additional survey was conducted from February 7 to February 20, 2020, with responses from an additional 5,281 respondents, giving us a total of 15,574 respondents. The WSQL focuses on people's wellbeing to understand

[14] https://www5.cao.go.jp/keizai2/wellbeing/manzoku/index.html

Japan's economy and society. This survey, much like baseline data, asks respondents questions on life satisfaction. It includes the same questions on general life satisfaction on a scale of 0 to 10 and basic socioeconomic information. I use this survey to characterize wellbeing in the population in the period before the COVID-19 infestation. While baseline data and the supplemental data (WSQL) may not always be fully identical, the descriptive statistics are not so much different with each other.

TableA1. Descriptive statistics

	Pre-COVID19 (WSQL)		Wave 1		Wave 2	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Female	0.50	0.50	0.50	0.50	0.50	0.50
Junior high	0.03	0.16	0.02	0.15	0.02	0.14
High school	0.30	0.46	0.28	0.45	0.28	0.45
Vocational School	0.12	0.33	0.12	0.33	0.12	0.33
Junior college	0.12	0.32	0.11	0.32	0.12	0.32
University	0.39	0.49	0.41	0.49	0.41	0.49
Graduate school	0.05	0.21	0.04	0.20	0.05	0.21
Never married	0.25	0.44	0.33	0.47	0.35	0.48
Married	0.69	0.46	0.58	0.49	0.57	0.49
Divorced	0.04	0.21	0.06	0.24	0.06	0.24
Widowed	0.01	0.12	0.02	0.14	0.02	0.14
Kids below age 18 in HH	0.27	0.45	0.21	0.41	0.21	0.40
Full time	0.39	0.49	0.39	0.49	0.40	0.49
Part time	0.20	0.40	0.18	0.38	0.17	0.38
Self-employ etc.	0.11	0.31	0.09	0.29	0.08	0.27
Break/Unemployed	0.03	0.17	0.03	0.17	0.04	0.19
Not employed including student	0.27	0.44	0.31	0.46	0.31	0.46
Number of observations	15,574		10,092		10,091	

Appendix 2.

Fig. A1 shows the wellbeing of men and women in pre-COVID; May 2020; December 2020. WSQL surveyed in February 2019 and 2020, both were the pre-COVID time. In comparing supplemental WSQL data to retrospective data in wave 1 that captures the pre-COVID situation, we find that retrospective data are likely to have a higher value than data taken at that point in time. The plots show that, in the pre-COVID-19 survey,

WSQL, the average score for men was approximately 5.7, while the average score for women was about 5.9. In the baseline data, respondents tend to answer a little bit well before the pandemic in retrospect, and the average score for men was 5.8 and women was 6.1.

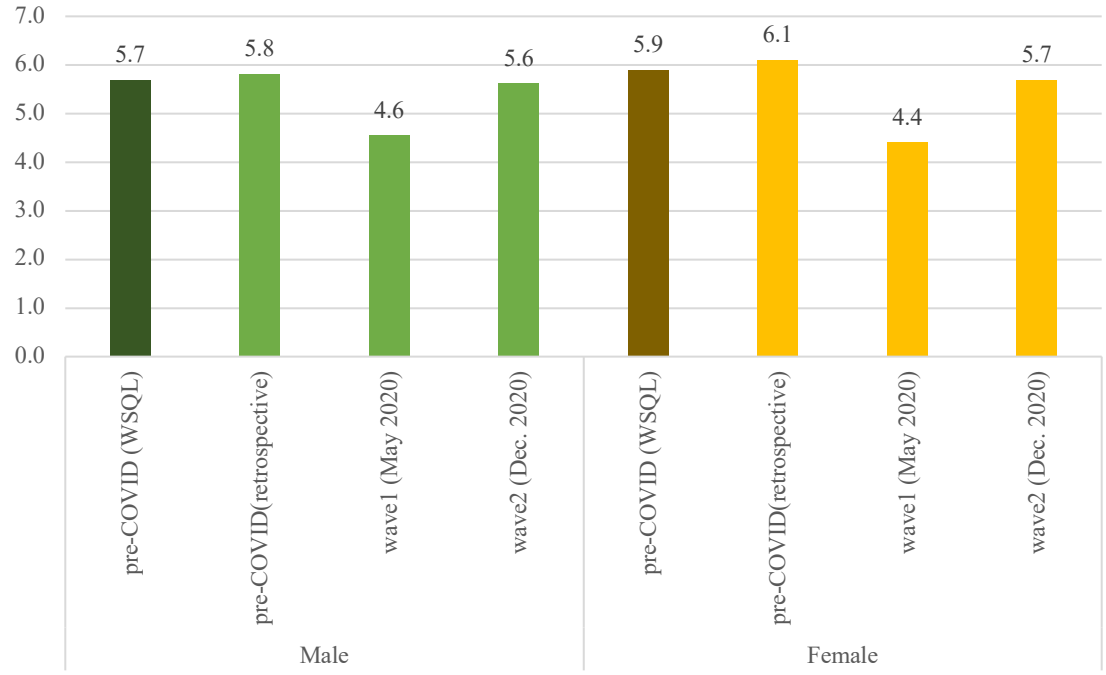


Fig A1 Life satisfaction (0–10) before and during the COVID-19 pandemic with supplemental data (WSQL)

Appendix 3.

To study the gender differences in wellbeing in Japan, I used rich nationally representative data before and during the COVID-19 survey at three different times: one from supplemental data, WSQL, which was surveyed before the crisis; and two points during the crisis, in wave 1(May–June 2020) and wave 2 (December 2020) of baseline data. An estimation is done using three periods of pooled data without the pre-COVID level of satisfaction in retrospect. I estimate the following equation by ordered logit model:

$$wellbeing_{it} = \beta_0 + \gamma_1 wave1 + \gamma_2 wave2 + \beta_1 Female + \delta_1 Female * wave1 + \delta_2 Female * wave2 + \boldsymbol{X'\beta} + \varepsilon_{it}$$

The main coefficients of interest here are those for a female dummy, a wave dummy for the surveyed period, and the interactions of female and wave dummies. The parameter γ

captures the differential effects in wellbeing in May 2020 and December 2020 under COVID-19 relative to the pre-COVID-19 period. The parameter β_1 captures the mean satisfaction of women compared with that of men. The parameter δ captures the gender difference in wellbeing and allows for different effects by wave to account for the different evolution of wellbeing for men and women in May 2020 and December 2020 under COVID-19, compared with the pre-COVID 19 crisis.

Table A3. Ordered logit estimation of life satisfaction

	Dep. var = wellbeing level(ordinal number)		
	total	not parents	parents
	(1)	(2)	(3)
1.wave	-1.07***	-1.01***	-1.21***
	[-31.29]	[-25.56]	[-17.60]
2.wave	-0.19***	-0.12***	-0.36***
	[-5.71]	[-2.97]	[-5.12]
Female	0.30***	0.33***	0.18***
	[10.20]	[9.66]	[2.77]
1.wave * Female	-0.29***	-0.32***	-0.20**
	[-6.39]	[-6.08]	[-2.19]
2.wave* Female	-0.10**	-0.10*	-0.13
	[-2.15]	[-1.94]	[-1.39]
Observations	33,772	25,262	8,510

z-statistics in brackets

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

Education, household income, age, prefecture of residence controls included.

Column (1) reports the results for general life satisfaction for all respondents with controls, column (2) for people without children, column (3) for parents with children under 18 years old. The results show significant decrease in life satisfaction for the early stage and middle stage of COVID-19. As in the main estimation, we can see some recovery in satisfaction in December in wave 2. The estimated parameters δ_1 and δ_2 shows that women do experience significantly different changes in satisfaction compared to men in May. The gender difference still exist for those without children in December, but for those with children.

Table A4. Ordered logit estimation of life satisfaction at the early stage of the COVID-19 crisis

	Dep. var = wellbeing level(ordinal number)							
	No children		With children		With childen in elementary school or younger		Without childen in elementary school or younger	
	Men	Women	Father	Mother	Father	Mother	Father	Mother
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Work from home	0.40***	0.40***	0.39**	0.07	0.45**	0.18	1.30	-1.41
	[5.90]	[4.67]	[2.41]	[0.35]	[2.49]	[0.82]	[1.52]	[-0.59]
decreasing working hours	-0.24***	-0.18***	0.02	0.01	0.09	0.02	-0.76	1.01
	[-3.90]	[-2.60]	[0.10]	[0.08]	[0.55]	[0.10]	[-1.36]	[1.03]
increasing working hours	-0.27**	-0.21*	-0.23	0.01	-0.20	0.02	-1.54	1.77
	[-2.46]	[-1.74]	[-0.91]	[0.04]	[-0.76]	[0.07]	[-1.09]	[0.95]
SP_Work from home			0.08	0.26	0.13	0.25	0.08	3.13***
			[0.40]	[1.32]	[0.58]	[1.19]	[0.10]	[2.67]
SP_decreasing working hours			-0.47***	-0.50***	-0.49***	-0.52***	-0.86	0.61
			[-2.85]	[2.70]	[-2.73]	[2.62]	[-1.22]	[0.60]
SP_increasing working hours			-0.51	0.28	-0.98**	0.73	3.94***	-0.02
			[-1.43]	[0.55]	[-2.48]	[1.32]	[3.44]	[-0.01]
Husband role increase			0.10	0.19	0.24	0.29	-0.87	-3.58***
			[0.65]	[1.06]	[1.44]	[1.55]	[-1.23]	[-2.69]
Wife role increase			-0.14	-0.37**	0.02	-0.48***	-1.76*	0.03
			[-0.84]	[-2.17]	[0.12]	[-2.67]	[-1.94]	[0.02]
Observations	3,734	2,915	725	597	626	535	99	62

t-statistics in brackets

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

Education, household income, age, prefecture of residence controls included.

References

Adams-Prassl, A., Boneva, T., Golin, M., & Rauh, C. (2020a). Inequality in the impact of the coronavirus shock: Evidence from real time surveys, *Journal of Public Economics*, 189, 104245.

Adams-Prassl, A., Boneva, T., Golin, M., & Rauh, C. (2020b). The impact of the coronavirus lockdown on mental health: Evidence from the US. University of Oxford. https://doi.org/10.17863/CAM.57997

Aguiar, M., & Hurst, E. (2007). Measuring trends in leisure: The allocation of time over five decades. *The Quarterly Journal of Economics*, *122*(3), 969–1006.

Alison L. B, &Van Ours, Jan C. (2008). Job satisfaction and family happiness: The Part-Time Work Puzzle. *The Economic Journal*, 118(526), F77–F99. https://doi.org/10.1111/j.1468-0297.2007.02117.x

Alon, T. M., Doepke, M., Olmstead-Rumsey, J., & Tertilt, M. (2020). The impact of COVID-19 on gender equality. NBER Discussion Paper No. 26947. https://www.nber.org/papers/w26947

Alison A., et al. (2020). The gendered division of paid and domestic work under lockdown. IZA Discussion Papers, No. 13500, Institute of Labor Economics (IZA)

Beham, B., Drobnič, S., Präg, P., Baierl, A., & Eckner, J., (2019). Part-time work and gender inequality in Europe: a comparative analysis of satisfaction with work–life balance, *European Societies*, 21:3, 378-402, DOI: 10.1080/14616696.2018.1473627

Belot, M., Choi, S., Tripodi, E. et al. (2021). Unequal consequences of Covid 19: representative evidence from six countries. *Review of Economics of the Household*, 19, 769–783. https://doi.org/10.1007/s11150-021-09560-z

Binder, M. (2016) . Revisiting Cheerful Jane and Miserable John: the impact of income, good health, social contacts and education declines with increasing subjective well-being, *Applied Economics Letters*, 23(8): 544–53.

Biroli P, Bosworth S, Della Giusta M., Di Girolamo A., Jaworska S., & Vollen J. (2021). Family Life in Lockdown. *Frontiers in Psychology,* 12:687570. doi: 10.3389/fpsyg.2021.687570

Brodeur, A., Gray, D., Islam, A., & Bhuiyan, S. (2021a). A literature review of the economics of COVID-19. *Journal of Economic Surveys*, *35*, 1007–1044. https://doi.org/10.1111/joes.12423

Brodeur, A., Clark, A. E., Fleche, S., & Powdthavee, N. (2021b). COVID-19, lockdowns and well-being: Evidence from Google Trends. *Journal of Public Economics*, 193, 104346.

Champeaux, H., & Marchetta, F. (2021). Couples in lockdown, ”La vie en rose”? Evidence from France. *Covid Economics*, 73, 158-187. https://cepr.org/sites/default/files/CovidEconomics73.pdf

Davillas, A., & Jones, A. M. (2020). The COVID-19 pandemic and its impact on inequality of opportunity in psychological distress in the UK. SSRN Working Paper. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3614940.

De Pedraza, P., Guzi, M., & Tijdens, K. (2020). Life dissatisfaction and anxiety in COVID-19 pandemic. Global Labor Organization Working Paper No. 544. https://www.econstor.eu/bitstream/10419/217053/1/GLO-DP-0544.pdf.

Del Boca, D., Oggero, N., Profeta, P., & Rossi, M. (2020). Women's and men's work, housework and childcare, before and during COVID-19. *Review of Economics of the Household, 18*, 1001–1017.

Etheridge, B., & Spantig, L. (2020). The gender gap in mental wellbeing during the Covid-19 outbreak: Evidence from the UK. Institute for Social and Economic Research Working Paper No. 2020-08. https://www.econstor.eu/handle/10419/227789

Farré, L., Fawaz, Y., Gonzalez, L., & Graves, J. (2020*).* How the COVID-19 lockdown affected gender inequality in paid and unpaid work in Spain. IZA Discussion Paper No. 13434. http://ftp.iza.org/dp13434.pdf.

Feng, Z. and Savani, K. (2020). Covid-19 created a gender gap in perceived work productivity and job satisfaction: implications for dual-career parents working from home. *Gender in Management*, 35, 7/8, 719-736. https://doi.org/10.1108/GM-07-2020-0202å

Gash, V., Mertens, A. & Gordo, L.R. (2012). The influence of changing hours or work on women's life satisfaction. *The Manchester School*, 80: 51-74. https://doi.org/10.1111/j.1467-9957.2011.02255.x

Gupta, S., Montenovo, L., Nguyen, T. D., Rojas, F. L., Schmutte, I. M. et al. (2020). Effects of social distancing policy on labor market outcomes. NBER Working Papers 27280, National Bureau of Economic Research, Inc.

Huebener, M., Waights, S., Spiess, C. K., Siegel, N. A., & Wagner, G. G. (2021). Parental wellbeing in times of Covid-19 in Germany. *Review of Economics of the Household*, *19*, 91–122. https://doi.org/10.1007/s11150-020-09529-4

Hupkau, C. & Petrongolo, B. (2020). Work, care and gender during the COVID-19 Crisis. *Fiscal Studies*, 41: 623-651. https://doi.org/10.1111/1475-5890.12245

Inoue, C., Ishihata, Y., & Yamaguchi, S. (2021). Working from home leads to more family-oriented men. CREPE Discussion Paper, No. 109.

Lunau, T., Bambra, C., Eikemo, T. A., van der Wel, K. A. & Dragano, N. (2014). A balancing act? Work–life balance, health and well-being in European welfare states. *European Journal of Public Health*, 24 (3), 422-427. https://doi.org/10.1093/eurpub/cku010

Mangiavacchi, L., Piccoli, L., & Pieroni, L. (2020). Fathers matter: Intra-household responsibilities and children's wellbeing during the COVID-19 lockdown in Italy. *Economics and Human Biology*, 42, 101016

Möhring, K., Naumann, E., Reifenscheid, M., Wenz, A., Rettig, T., Krieger, U., et al., (2021). The COVID-19 pandemic and subjective well-being: longitudinal evidence on satisfaction with work and family. *European Societies*, 23(1), 601-617. DOI:10.1080/14616696.2020.1833066

Montenovo, L., Jiang, X., Rojas, F. L., Schmutte, I. M., Simon, K. I., Weinberg, B. A., et al., (2020). Determinants of disparities in covid-19 job losses. National Bureau of Economic Research Working Paper No. 27132. https://www.nber.org/papers/w27132

Niedzwiedz, C. L., Green, M. J., Benzeval, M., Campbell, D., Craig, P., Demou, E., et al., (2021). Mental health and health behaviours before and during the initial phase of the COVID-19 lockdown: Longitudinal analyses of the UK Household Longitudinal Study. *Journal of Epidemiology and Community Health*, *75*(3), 224–231

Oreffice, S., & Quintana-Domeque, C. (2021). Gender inequality in COVID-19 times: Evidence from UK prolific participants. *Journal of Demographic Economics*, *87*(2), 261–287. doi:10.1017/dem.2021.2

Proto, E., & Quintana-Domeque, C. (2021). COVID-19 and mental health deterioration by ethnicity and gender in the UK. PLoS ONE, 16(1): e0244419. https://doi.org/10.1371/journal.pone.0244419

Reichelt, M., Makovi, K., & Sargsyan, A. (2021). The impact of COVID-19 on gender inequality in the labor market and gender-role attitudes. *European Societies*, 23(sup1), S228–S245. DOI: 10.1080/14616696.2020.1823010

Reuschke D. (2019). The subjective well-being of homeworkers across life domains. *Environment and Planning A: Economy and Space*.51(6):1326-1349. doi:10.1177/0308518X19842583

Russell, R., & Sun, C. (2020). The Effect of Mandatory Child Care Center Closures on Women's Labor Market Outcomes During the COVID-19 Pandemic, *Covid Economics*, 62-6.

Schoonbroodt, A. (2018). Parental child care during and outside of typical work hours. *Review of Economics of the Household*, *16*(2), 453–476.

Sevilla, A., & Smith, S. (2020). Baby steps: The gender division of childcare during the COVID-19 pandemic. *Oxford Review of Economic Policy*, *36*(Supplement_1), 169–186. https://doi.org/10.1093/oxrep/graa027

Tanaka, T., Okamoto, S. (2021). Increase in suicide following an initial decline during the COVID-19 pandemic in Japan. Nature Human Behavior, 5, 229–238. https://doi.org/10.1038/s41562-020-01042-z

Wheatley, D. (2017). Employee satisfaction and use of flexible working arrangements, *Work, Employment and Society,* 31(4): 567–85.

Yamamura, E., & Tsustsui, Y. (2021a). The impact of closing schools on working from home during the COVID-19 pandemic: Evidence using panel data from Japan. *Review of Economics of the Household, 19*, 41–60. https://doi.org/10.1007/s11150-020-09536-5

Yamamura, E., & Tsustsui, Y. (2021b). School closures and mental health during the COVID-19 pandemic in Japan. *Journal of Population Economics*, *34*, 1261–1298. https://doi.org/10.1007/s00148-021-00844-3

Zamarro, G., & Prados, M. J. (2021). Gender differences in couples' division of childcare, work and mental health during COVID-19. *Review of Economics of the Household, 19*, 11–40. https://doi.org/10.1007/s11150-020-09534-7

Zoch, G., Bächmann, A.-C. & Vicari, B. (2020). Care-arrangements and parental well-being during the COVID-19 pandemic in Germany. LIfBi Working Paper No. 91.

Leibniz Institute for Educational Trajectories.
https://doi.org/10.5157/LIfBi:WP91:2.0