Traditional Gender Roles Persist: The Impact of Remote Work on Household Dynamics Amidst the COVID-19 Pandemic in Japan

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<u>Abstract</u>

Despite the increase in female labour participation following "Abenomics," traditional gender roles persist in Japanese households, contributing to a significant disparity in housework. This study investigates the impact of remote work on household time allocation amidst the COVID-19 pandemic in Japan. Utilizing panel data from Osaka University's Preference Parameter Study, we analyse double-income households from 2018 and 2021 to 2023. Our findings indicate that before the pandemic, teleworking husbands spent more time on both market and non-market work compared to their non-teleworking counterparts. However, this trend reversed post-pandemic, with teleworking husbands reducing their time spent on both types of work. This shift may be attributed to the unpreparedness of both employers and employees for the sudden transition to remote work, as well as challenges related to workers' adaptability to new technologies. Our study underscores the persistent influence of traditional gender roles and highlights the need for supportive policies to address these disparities.

JEL Classification: D13, J22, M14

Keywords: Remote work, Household production, Time allocation, Labor supply, Japan

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Introduction

The introduction of the "Womenomics" initiative in 2014 sparked optimism and motivated many married women in Japan to re-enter the workforce (Takami 2019, BBC 2018, The Government of Japan 2014), enabling them to sustain employment even after completing their child-rearing responsibilities (Matsui, Suzuki and Tatebe 2019). However, despite these positive developments, women continue to face obstacles in advancing their careers (Kachi, et al. 2021, Kawase, et al. 2021, Kawaguchi 2019, McCurry 2015). The significant challenges are the heavy burden of housework and childcare responsibilities shouldered by women (Hamada 2021), often prompting them to opt for more flexible forms of employment instead of full-time positions (T. Sato 2023, Takeda 2018). Additionally, even when women work full-time, these household obligations may hinder their ability to take on overtime hours, which can convey a negative signal to employers (Mahoney 2020, Iida 2018). Without support for housework and childcare, women are frequently overlooked for promotion opportunities (Kachi, et al. 2021, Kawase, et al. 2021, Kawaguchi 2019). Nevertheless, it is crucial to acknowledge that many men, especially those in full-time positions, already endure long working hours (Ono 2018). The wide gender gap in both market work and non-market work has led to calls to encourage men to work fewer hours (Takahara 2023), thereby creating opportunities for women to increase their participation in the workforce. The onset of the COVID-19 pandemic in April 2020 brought about significant shifts in economic activity, resulting in reduced work hours. Concurrently, social distancing measures, including widespread adoption of remote work, led to a decline in commuting time. This shift in work dynamics potentially freed up more time for male workers to handle household chores. Therefore, our study aims to explore the gendered impacts of telework and the COVID-19 pandemic on time allocation in household chores. Utilizing a with data from Osaka University's Preference Parameter Study conducted between 2018 and 2021-2023; we seek to uncover how shifting work arrangements and societal changes have influenced the distribution of household responsibilities.

<u>Data</u>

This research utilizes panel datasets from Osaka University, specifically the 2016-2018 and 2021-2023 Preference Parameter Study (PPS). By pooling these datasets, we gathered a total of 12,501 observations from married individuals, which we categorized into double-income and single-income households. To simplify the analysis, our study focuses exclusively on the sample from double-income households from the 2018 and 2021-2023 (PPS). This specific group

includes 1,052 individuals who consistently reported their time allocation to work and housework during these periods.

Our dependent variables include total time spent on work—including regular work, paid overtime, and unpaid overtime—as well as total time spent on housework, differentiated by weekdays and weekends. The total time spent on work is calculated from responses to the question, "About how many hours per week do you and your spouse usually work, including overtime?" Additional details on paid and unpaid overtime are derived from sub-questions about weekly overtime hours. We calculate regular work hours by subtracting overtime hours from the total work hours, with all time variables converted into minutes for precise analysis. Unfortunately, the 2023 PPS data lacked specific details on regular work hours, paid overtime, and unpaid overtime, reducing the number of observations by roughly 700 observations. Consequently, we might prioritize total work hours as our primary outcome variable. For non-market variables, time spent on housework is assessed from responses to, "How much time do you and your spouse spend doing housework every day? Please answer an average amount of time per day for weekdays and weekends." We aggregate these daily averages to compute the total time spent on housework.

The primary explanatory variable in this study is telework, assessed during the 2021-2023 PPS. The survey inquired about the frequency of home teleworking per week for both the respondents and their spouses, with classifications based on whether they almost always commute, telework once or twice a week, or telework three or more times per week. Those engaging in home telework at least once a week on average were classified as teleworkers (telework = 1); all others were non-teleworkers (telework = 0). As telework data from the 2016-2018 PPS was unavailable, we relied on retrospective questions from the 2021 PPS about home teleworking situations in January 2020, prior to the pandemic. Given potential inaccuracies, we assumed telework behaviour in January 2020 was similar to that in 2018 and excluded observations from 2016-2017 in later regression analyses. As a result, our focused sample consists of 1,883 observations.

Furthermore, our study classifies data from 2021 to 2023 as post-pandemic (postpandemic = 1) and data from 2018 as pre-pandemic (post-pandemic = 0), facilitating an analysis of changes in work and home life dynamics before and after the pandemic's onset. We use this classification to generate control variables such as telework feasibility and the post-pandemic telework adoption rate. The proportion of teleworking employees within each industry before the pandemic represents telework feasibility. Meanwhile, the proportion of teleworking employees within each industry after the pandemic serves as the representation for the telework adoption rate. Definitions for control variables are detailed in Table A1.

Variable			Full sam	ple	
	Obs	Mean	Std. Dev.	Min	Max
a. Dependent variables					
Time on market work	1,883	2,311.5140	921.7993	120.0000	6600.0000
Regular work time	1.146	2,054.6600	760.4522	0.0000	6000.0000
Paid overtime	1.149	127.5718	272.1385	0.0000	1800.0000
Unpaid overtime	1,180	142.6780	323,1214	0.0000	2400.0000
Time on housework	1.883	259.2841	248.5103	0.0000	1590.0000
Weekday housework	1 878	112 1219	117 5657	0.0000	1080 0000
Weekend housework	1.851	150.0092	142.6846	0.0000	1080.0000
b. Explanatory variables	-,				
Time variables					
Post-Pandemic	1.883	0.7854	0.4106	0.0000	1.0000
Work variable	1,005	0.7001	0.1100	0.0000	110000
Telework	1 883	0.0685	0 2527	0.0000	1 0000
Telework x Post-Pandemic	1,883	0.0616	0.2405	0.0000	1.0000
c. Control variables	1,005	0.0010	0.2102	0.0000	1.0000
Demographic variables					
Male	1 883	0 5040	0 5001	0.0000	1 0000
Birth year	1 883	1 965 2700	7 8610	1934 0000	1987 0000
University degree	1 883	0.3181	0.4659	0.0000	1 0000
Household variables	1,005	0.5101	0.1057	0.0000	1.0000
Length of marriage	1 883	28 7191	8 5149	5 0000	61,0000
Number of household members	1 883	3 4918	1 1872	1,0000	8 0000
Number of children	1 883	2 1482	0.8017	0.0000	5,0000
Living with parents	1,883	0.2161	0.4117	0.0000	1 0000
Owning accommodation	1 883	0.9464	0.2254	0.0000	1.0000
Income variables	1,005	0.9404	0.2234	0.0000	1.0000
Estimated income	1 883	3 0330	2 1186	0.0061	11 8800
Income group 1	1 883	0.3181	0.4659	0.0001	1 0000
Income group 2	1 883	0.2777	0.4480	0.0000	1.0000
Income group 3	1,005	0.4041	0.4909	0.0000	1.0000
Work variables	1,005	0.4041	0.7707	0.0000	1.0000
White collar	1 883	0 5082	0.5001	0.0000	1 0000
Full-time employment	1,883	0.5082	0.3001	0.0000	1.0000
More than ten years at the firm	1,005	0.5858	0.4927	0.0000	1.0000
Private employment	1,005	0.0391	0.4742	0.0000	1.0000
I arge firm	1,005	0.7389	0.4279	0.0000	1.0000
Male-dominated industry	1,005	0.1900	0.3970	0.0000	1.0000
Telework feasibility index	1,005	0.4023	0.4903	0.0000	1.0000
Telework adoption index	1,885	0.0430	0.0493	0.0000	0.2727
Attitude variables	1,005	0.1049	0.0313	0.0017	0.3017
Attitude toward women	1 007	0.2924	0.1600	0.0000	0.0500
Time variables	1,885	0.3824	0.1600	0.0000	0.9300
2018	1 000	0 2146	0.4106	0.0000	1 0000
2010	1,003	0.2140	0.4100	0.0000	1.0000
2021	1,883	0.2001	0.4040	0.0000	1.0000
2022	1,885	0.2114	0.4084	0.0000	1.0000
2023	1,883	0.3680	0.4824	0.0000	1.0000

TABLE 1 – Summary Statistics of Sample from Double Income Household

Notes: The sample was used in estimating total time spent on housework.

Table 1 provides descriptive statistics for double-income couples in our dataset, focusing on observations from the 2018 and 2021-2023 PPS. The sample was used in estimating total time spent on housework. A significant portion (78.55%) of our sample is recorded in the post-pandemic period, with breakdowns by year. On average, individuals in our sample dedicated approximately 38 hours and 31 minutes per week to market work. The breakdown includes about 34 hours and 14 minutes of regular work, approximately 2 hours and 7 minutes of paid overtime, and about 2 hours and 22 minutes of unpaid overtime. In terms of housework, the average time spent per week was at around 4 hours and 19 minutes. They spent roughly 1 hour and 52 minutes on weekday and 2 hours and 30 minutes on weekend.

Table 1 also provides insights into the average work behaviours and characteristics of our focus sample. Notably, 6.85% of the sample engaged in home telework before the pandemic and 6.16% engaged in home telework after the pandemic. Additionally, 50.82% of the focus sample are white-collar workers, and 58.58% are employed full-time. A significant 65.91% of respondents have been with their current company for more than ten years. Regarding sector employment, 75.89% work in the private sector, and 19.60% are employed in large companies with 1,000 employees or more. The industry breakdown shows that 40.25% work in male-dominated fields. An average telework feasibility is 4.5% whereas post-pandemic telework adoption is around 10.49%.

Since same-sex marriage is not legalized in Japan, our study adopts Grossbard's (2014) definition of marriage, which assumes that a household consists of a husband and wife. Although the survey does not disclose the gender of the spouse, we assume that the spouse of each survey respondent is of the opposite gender. Our focus is on the interactions between husband and wife; therefore, we exclude respondents who did not provide information about their spouse. For analysis purposes, we pooled survey respondents and their spouses into a single sample. Consequently, our sample composition is balanced, with 50% male and 50% female.

Several key insights into the sample regarding demographic and household characteristics can be seen in Table 1. Notably, 31.81% of the sample holds a university degree. Additionally, 21.61% of respondents live with their parents, and a significant majority, 94.64%, own their accommodation. The average participant was born in 1965 and has been married for approximately 28 years. Furthermore, these individuals typically reside in households consisting of about 3.49 members and have an average of 2 children. The data suggests that their or their spouse's attitudes toward women are relatively liberal. In terms of income, the average income is 3.03 million Japanese Yen, with the distribution appearing dense at the tails, indicating variability at the higher and lower ends of the income spectrum.

Given that the division of labour, both in the workplace and at home, is still widely practised in Japan, we conducted mean-test analyses by gender (Table 2) to examine differences in time allocation and characteristics between husbands and wives.

Variable	Husband Wife			Mean		
variable	Mean	Obs	Mean	Obs	difference	t-statistics
a. Dependent variables						
Time on market work	2,761.7700	949	1,854.0260	934	907.7446***	24.5423
	(785.7799)		(819.0821)			
Regular work time	2,357.5860	580	1,744.2400	566	613.3459***	14.9124
	(690.6009)		(701.7473)			
Paid overtime	189.2784	582	64.2328	567	125.0455***	7.9977
	(333.5562)		(167.5401)			
Unpaid overtime	214.4147	598	68.9691	582	145.4456***	7.9308
	(387.0746)		(217.2048)			
Time on housework	91.6312	949	429.6296	934	-337.9984***	-40.2458
	(94.0872)		(240.7093)			
Weekday	34.0763	944	191.0032	934	-156.9269***	-38.8347
	(52.6207)		(112.3204)			
Weekend	58.8507	931	242.2576	920	-183.4069***	-36.0885
	(60.3255)		(142.7007)			
<u>b. Explanatory variables</u>						
Telework	0.0864	949	0.0503	934	0.0361***	3.1055
	(0.2811)		(0.2187)			
Telework x Post-Pandemic	0.0822	949	0.0407	934	0.0415***	3.7575
	(0.2748)		(0.1977)			
<u>c. Control variables</u>						
University degree	0.4563	949	0.1777	934	0.2785***	13.5904
	(0.4983)		(0.3825)			
Estimated income (million JPY)	4.2361	949	1.8106	934	2.4255***	30.2897
	(2.0921)		(1.2800)			
White collar	0.5553	949	0.4604	934	0.0949***	4.1365
	(0.4972)		(0.4987)			
Full-time employment	0.8188	949	0.3490	934	0.4697***	23.5236
	(0.3854)		(0.4769)			
More than ten years at the firm	0.7703	949	0.5460	934	0.2242***	10.5578
	(0.4209)		(0.4981)			
Private employment	0.7271	949	0.7912	934	-0.0641***	-3.2607
	(0.4457)		(0.4067)			

TABLE 2 – Gender Disparity within Double Income Households on Time Allocation and Other Characteristics

Notes: This table displays the average disparities in time allocation between market and non-market work from 2018 and the 2021-2023 PPS. This table also displays the average differences in characteristics between husbands and wives in double-income households. Additionally, the table indicates the deviation of the wife's average means from the husband's average means (i.e., the husband's mean minus the wife's mean). Statistical significance is denoted by *** at the 99% confidence level.

As anticipated, disparities exist between the time allocation and characteristics of husbands and wives, reflecting traditional gender roles within households. Table 2 illustrates that, on average, husbands dedicate more time to market work, while wives allocate more time to non-market work, such as household duties and caregiving. Economically, husbands also tend to earn significantly more than their wives. Professionally, husbands are more likely to hold white-collar

jobs, work full-time, and have longer tenure at their current employment compared to their wives. Wives are more likely to work in a private sector. Additionally, husbands are more likely to have the option to work from home. These differences underscore the persistent gender-specific roles in both professional and domestic environments in Japan.

Method

Given that telework data were collected during the pandemic, when many individuals were adhering to social distancing policies, it is crucial to consider the potential for the pandemic to confound our analysis. Felstead and Henseke (2017) have indicated that teleworking does not decrease productivity and may even lead to an increased likelihood of working overtime. However, the rapid and often unprepared adoption of telework during the pandemic could potentially lower productivity and lead to reduced work hours. Coupled with social distancing policies that encourage people to stay at home, there is a possibility that individuals may shift their focus more towards household chores. Consequently, this could lead us to underestimate the impact of telework on work hours while overestimating its effect on housework.



between Husbands and Their Spouses



Notes: Figure 1 displays the average number of hours spent on market work per week in 2016-2018 and 2021-2023. Figure 2 displays the differences in average annual incomes between husbands and their spouses in 2016-2018 and 2021-2023.

Despite these potential discrepancies, Figure 1 and Figure 2, show an absence of what is known as Ashenfelter's Dip in work hours and income. This suggests that the expected preintervention dip in outcomes before the adoption of telework did not occur, allowing us to focus more clearly on the impacts of teleworking. To disentangle these confounding effects more effectively, we employ a difference-in-differences analysis. This approach allows us to compare changes over time between those who adopted telework and those who did not, helping to isolate the effect of teleworking from other pandemic-related changes.

$$\ddot{y}_{it} = T\ddot{e}le_{it}\gamma + P\ddot{o}st_{it}\delta + (Tele \,\ddot{*}\,Post)_{it}\theta + \ddot{X}_{it}\beta + \ddot{u}_{it} \tag{1}$$

To observe change within an individual over time, we focus on the within-transformation model, as shown in equation (1). y_{it} represents outcome variables of an individual i^{th} in period t. *Tele* represents telework behaviour. *Post* represents periods after COVID-19 were categorised as a pandemic. *Tele* * *Post* represents an interaction term. *X* represents a vector of control variables. *u* represents a vector of the residual term.

Results

Table 3 presents the effects of telework, the pandemic, and their interaction on the time spent on market work. According to Table 3, pre-pandemic telework provided more time spent on market work by 7 hours and 36 minutes. Conversely, the onset of the pandemic decreased total work hours by an hour and 12 minutes and reduced unpaid overtime by 40 minutes. Moreover, the adoption of telework after the pandemic resulted in a decrease in total work hours by 8 hours and 16 minutes. Additionally, we observed a complementary relationship between a spouse's time spent on housework and the respondent's total market work hours. Specifically, an increase of one hour in a spouse's housework correlates with a 26-minute increase in the respondent's total time spent on market work. This finding suggests an interplay where one spouse's increased contribution to household chores may enable the other to allocate more time to professional tasks, highlighting the dynamic balance within double-income households.

Table 3 also elucidates the changes in time spent on housework in response to the pandemic and telework. Notably, while telework did not significantly affect time spent on housework, the pandemic itself led to an increase in housework hours. According to Table 4, the pandemic increased the time spent on housework during weekdays by roughly 9 minutes, contributing to a total increase of 14 minutes in overall time spent on housework. Furthermore, the table reveals a nuanced complementary relationship between a spouse's total time spent on market work and the respondent's time spent on housework. An increase of one hour in time spent on market work by one's spouse correlates with a two-minute increase in time spent on housework by the respondent. Meanwhile, we observed a negative correlation between an hour's increase in total time spent on market work and a reduction of 49 seconds in time spent on housework. This indicates a subtle trade-off where increases in professional work slightly diminish the time available for household tasks.

	Market work				Non-market	work	
Variables	Total work hour	Work hour	Paid overtime	Unpaid overtime	Housework	Weekday	Weekend
Main variables							
Telework	456.5**	118.5	102.0	-69.89	26.37	31.56	-3.332
	(208.2)	(338.4)	(188.2)	(149.4)	(42.43)	(23.72)	(26.62)
Post-pandemic	-72.02*	-39.84	-8.655	-40.51*	14.39	9.313*	3.956
-	(40.63)	(49.95)	(27.70)	(21.34)	(8.949)	(5.005)	(5.673)
Telework x	-496.8**	-385.2	19.14	71.53	-25.29	-31.92	5.057
Post-pandemic	(204.6)	(328.7)	(182.7)	(145.2)	(42.07)	(23.52)	(26.40)
Selected control varia	ables	. ,			. ,		
Total time on	-0.250	-0.432	-0.113	0.0725			
housework	(0.163)	(0.271)	(0.150)	(0.116)			
Total time on	0.426***	0.298	-0.0804	0.0124			
housework - Spouse	(0.155)	(0.235)	(0.130)	(0.103)			
Total time on work					-0.0130 (0.00796)	-0.00810* (0.00445)	-0.00324 (0.00512)
Total time on work					0.0162**	0.00550	0.00693
- Spouse					(0.00786)	(0.00439)	(0.00500)
Observations	1,873	1,141	1,144	1,175	1,883	1,878	1,851
R-squared	0.118	0.134	0.102	0.092	0.063	0.053	0.059
Number of obs id	1,049	747	749	762	1,052	1,048	1,039

TABLE 3 – The Effects of Telework, Pandemic and Interaction on Market Work Time Allocation

Notes: This table compares the within estimated effects of telework, post-pandemic, and their interaction on market and nonmarket work time allocation within double-income households. Each row presents estimates of different explanatory variables in various models with different explained time allocation variables. These estimates are adjusted for demographic characteristics, work characteristics, and income characteristics of survey respondents and their spouses. Market work estimates are also adjusted for the time spent on housework of survey respondents and their spouses, whereas non-market work estimates are adjusted for the total time spent on work of survey respondents and their spouses. Respondents' household characteristics and attitude characteristics are controlled for in the estimates. *, **, *** represent 90%, 95%, and 99% confidence level respectively.

The analysis reveals an increase in teleworking husbands' time allocation for both market work and housework before the pandemic. Table 4, contrasting estimates for husbands and wives, demonstrates that teleworking husbands devoted more time to both market and non-market work compared to their non-teleworking counterparts. Besides an increase in market work hours for teleworking husbands by 9 hours and 46 minutes, they also spent an additional 1 hour and 56 minutes on housework compared to non-teleworking husbands. However, this pattern shifted post-pandemic. Teleworking husbands experienced a significant decrease in market work hours by 10 hours and 20 minutes, coinciding with a significant reduction in housework by approximately 2 hours and 7 minutes.

Meanwhile, we observed a rise in the time spent on both market and non-market work among pre-pandemic teleworking wives as illustrated on Table 4. Nonetheless, the impact of telework on time allocation appears to be minor. Unlike the pre-pandemic period, telework is strongly associated with a reduction in wives' time spent on market work. On average, wives reduced their time on market work by 9 hours and 20 minutes. They also slightly increased their time spent on housework; however, the effect is statistically insignificant. Focusing solely on the pandemic, our findings indicate that husbands have statistically significantly reduced their time spent on market work by almost 2 hours while also experiencing a slight increase in time spent on housework by 3 minutes. Conversely, wives have slightly decreased their time spent on market work by 15 minutes but have statistically significantly increased their time spent on housework by 28 minutes.

	Market work				Non-market w	vork	
Variables	Total work hour	Work hour	Paid overtime	Unpaid overtime	Housework	Weekday	Weekend
<u>a.Husbands</u>							
Telework	585.9*	474.9	156.0	4.988	115.9**	61.88	54.06**
	(351.0)	(584.8)	(372.1)	(295.2)	(48.26)	(37.76)	(26.26)
Post-pandemic	-119.9*	-50.26	-36.81	-75.60*	3.365	10.38	-5.628
	(61.34)	(81.59)	(51.91)	(39.35)	(8.490)	(6.648)	(4.666)
Telework x	-620.4*	-756.8	0.249	16.95	-126.6**	-69.71*	-57.02**
Post-pandemic	(359.6)	(589.3)	(375.0)	(297.1)	(49.35)	(38.61)	(26.87)
Observations	947	579	581	597	949	944	931
R-squared	0.161	0.168	0.175	0.162	0.065	0.059	0.076
Number of obs id	526	377	379	387	526	522	518
<u>b.Wives</u>							
Telework	407.9	-113.9	-77.41	-8.859	27.61	36.30	-6.618
	(274.5)	(491.1)	(172.6)	(141.2)	(72.70)	(34.14)	(47.43)
Post-pandemic	-14.63	16.47	-2.192	0.489	27.73*	9.308	13.18
	(55.34)	(70.89)	(24.72)	(19.60)	(16.70)	(7.846)	(11.06)
Telework x	-559.7**	-201.9	69.56	24.97	37.23	-2.033	39.82
Post-pandemic	(243.2)	(421.4)	(148.1)	(120.6)	(66.60)	(31.28)	(43.47)
Observations	926	562	563	578	934	934	920
R-squared	0.157	0.204	0.201	0.162	0.121	0.132	0.107
Number of obs_id	523	370	370	375	526	526	521

TABLE 4 - The Gendered Effects of Telework, Pandemic and Interactions on Time Allocation

Notes: This table compares the within estimated effects of telework, post-pandemic, and their interaction on market and nonmarket work time allocation within double-income households. Estimates for husbands are provided in panel a, while estimates for wives are provided in panel b. Each row presents estimates of different explanatory variables in various models with different explained time allocation variables. These estimates are adjusted for demographic characteristics, work characteristics, and income characteristics of survey respondents and their spouses. Market work estimates are adjusted for the time spent on housework of survey respondents and their spouses, whereas non-market work estimates are adjusted for the total time spent on work of survey respondents and their spouses. Respondents' household characteristics and attitude characteristics are controlled for in the estimates. *, **, *** represent 90%, 95%, and 99% confidence level respectively.

Robustness Check

We conducted a robustness check by omitting extreme observations at the tails of distribution of market and non-market work hours. The results are presented in Table 5. Generally, we found that the estimates regarding market work are robust and consistent. However, the estimate pertaining to telework is not consistent in predicting time spent on housework.

Variables	Total work	hour		Housework		
variables	100%	95%	90%	100%	95%	90%
a. Main models						
Telework	456.5**	588.1***	506.5***	26.37	-1.589	-2.455
	(208.2)	(197.0)	(183.1)	(42.43)	(46.97)	(50.86)
Post-pandemic	-72.02*	-73.62**	-61.90**	14.39	11.22	9.287
	(40.63)	(35.27)	(31.09)	(8.949)	(9.286)	(9.713)
Telework x Post-	-496.8**	-567.5***	-502.4***	-25.29	5.058	6.116
pandemic	(204.6)	(196.2)	(180.2)	(42.07)	(47.14)	(50.47)
Observations	1,873	1,780	1,703	1,883	1,790	1,713
R-squared	0.118	0.153	0.158	0.063	0.064	0.063
Number of obs_id	1,049	1,001	968	1,052	1,004	971

TABLE 5 – Robustness Check on the Effects of Telework and Interactions on Market and Non-market Work Time Allocation

Notes: This table compares the within estimated effects of telework, post-pandemic, and their interaction on total time spent on market work and housework within double-income households. Each column presents the percentage of observations used in the regression analysis. The excluded observations are either at the bottom or top of the distribution for time spent on either total market work or total housework. Each row presents estimates of different explanatory variables. These estimates are adjusted for demographic characteristics, work characteristics, and income characteristics of survey respondents and their spouses. Market work estimates are adjusted for the time spent on housework of survey respondents and their spouses, whereas non-market work estimates are adjusted for the total time spent on work of survey respondents and their spouses. Respondents' household characteristics and attitude characteristics are controlled for in the estimates. *, **, *** represent 90%, 95%, and 99% confidence level respectively.

Discussion

The differing trends in telework behaviour before and after the pandemic underscore the significant role of worker autonomy in determining work style. Husbands may have chosen to telework before the pandemic, motivated by the desire to reduce time spent on morning routines and commuting (Andalón and Jones 2022). This saved time could then be reallocated to increase their total work hours. The saved time may also improve husbands' mental health and mental capacity, leading to an increase in labour power or labour capacity (Marx 1990), which in turn could result in longer work hours. In terms of housework, the increase in labour power might also lead to more time spent on household chores (Garcia 2023). Additionally, some of these workers might have chosen to telework to better assist their spouses with household chores, resulting in a further increase in the amount of time spent on housework. Moreover, it is likely that many of these pre-pandemic teleworkers had been teleworking for several years. Consequently, they were already accustomed to this mode of work and could manage market work and non-market work simultaneously. Although previous literature (A. Sato 2019) may argue that these pre-pandemic teleworkers might have been forced into telework, the increase in both market and non-market work suggests an increase in labour capacity or labour-power.

The COVID-19 pandemic forced many employees into home telework, a transition for which many were unprepared or unwilling (A. Sato 2019, Tsuru 2021). This involuntary shift

presented several challenges that negatively impacted productivity and work hours. Reevaluating the Milgram experiment (1963; 1974) and subsequent studies (Bandura 2006, Caspar, et al. 2016, Wegner 2003), it becomes evident that remote work can increase the physical and psychological distance between workers and their supervisors. This separation can hinder employers' ability to monitor employees effectively. As a result, the absence of direct supervision made it difficult for employees to maintain discipline and productivity levels. Working from home requires a high degree of self-motivation and discipline, which can be challenging for those used to the structured office environment.

The unprepared infrastructure also contributed to the decline in productivity, leading to decreased work hours. The swift implementation of telework caught both companies and employees unprepared (Denyer 2020). Both lacked the necessary tools and resources, such as high-speed internet, home office setups, and adequate computing equipment (Tsuru 2021), to work effectively from home. Consequently, remote work often leads to communication difficulties. Intuitively, the lack of face-to-face interaction also hindered effective collaboration and feedback.

Furthermore, the unwillingness to adopt telework might have contributed to the decline in work hours. According to Andalón and Jones (2022), the preference for telework positively influences telework labour supply regardless of whether office work is permitted. Given that the average age of our sample was 58 years in 2023, many workers struggled to adapt to the new technologies and platforms required for efficient telework (Tsuru 2021), leading to a reluctance to adopt this mode of work. Simultaneously, remote work during the pandemic may have caused anxiety among workers, decreasing their mental capacity (Niu, et al. 2021). This reduction in mental capacity can lead to a decline in labour-power (Marx 1990, Garcia 2023). As a result, they reduced their time spent on both work and housework.

Conclusion

Using the panel data from Osaka University's Preference Parameter Study, our analysis offers empirical evidence regarding the minimal effect of remote work on altering household dynamics. While remote work holds the potential to ease household chores and somewhat increase women's participation in the labour market, entrenched gender norms and societal pressures still maintain their influence over labour division within households. Given the government's goal of increasing female labour participation, policymakers might consider implementing housework-related policies. Ultimately, equality at home could be the key to the success of "Womenomics."

Our study adds to the body of literature by emphasizing the enduring presence of traditional gender roles and the obstacles women encounter in managing both career and domestic duties. It highlights the imperative for comprehensive societal shifts and supportive policy measures to tackle gender disparities not only in professional settings but also within the home. Future research could explore specifically how telework affects cooperative and non-cooperative households in terms of time allocation. Additionally, future studies may investigate the relationship between labour-power and time spent on housework in a telework setting.

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riable	Definition
Male	Binary variable: If an observation is male, the variable "Male" is equal to 1
mule	Otherwise. "Male" is equal to 0
Birth vear**	Discrete variable: Year that an observation was born.
University degree**	Binary variable: If an observation received a university degree, the variable
, ,	"University degree" is equal to 1. Otherwise, "University degree" is equal to 0.
Length of marriage	Discrete variable: Length of marriage between an observation and their
Number of household members	biscrete variable: Number of people living in a household, including a survey respondent.
Number of male children	Binary variable: Number of male children belonging to a survey respondent.
Number of female children	Binary variable: Number of female children belonging to a survey respondent.
Living with parents	Binary variable: If an observation is reported to live with their parents or their
	spouse's parents, the variable "Living with parents" is equal to 1. Otherwise, "Living with parents" is equal to 0.
Owning accommodation	Binary variable: If an observation is reported to own with their current
6	accommodation, the variable "Owning accommodation" is equal to 1.
	Otherwise, "Owning accommodation" is equal to 0.
Estimated income**	Continuous variable: If an observation provides their monthly salary
	information, we estimate the annual income by multiplying the salary by twelve, assuming that the observation works 12 months annually. If an
	observation provides their hourly wage information instead we estimate the
	annual income as follows: First we calculate the weekly income by
	multiplying the wage by the total work hours. Then we determined the
	average daily income by dividing the weekly income by 5 assuming that the
	observation works five days per week on average Finally we estimated the
	annual income by multiplying the average daily income by the number of
	working days per year (unit millions of Japanese yen)
Income group 1**	Binary variable: If an observation's estimated income falls within the lower
meonie group i	income tertile, the variable "Income group 1" is equal to 1. Otherwise
	"Income group 1" is equal to 0
Income group 2**	Binary variable: If an observation's estimated income falls within the middle-
8 ··F -	income tertile, the variable "Income group 2" is equal to 1. Otherwise,
	"Income group 2" is equal to 0.
Income group 3**	Binary variable: If an observation's estimated income falls within the upper-
	income tertile, the variable "Income group 3" is equal to 1. Otherwise,
	"Income group 3" is equal to 0.
Working**	Binary variable: If an observation works, the variable "Working" is equal to 1.
	Otherwise, "Working" is equal to 0.
White collar**	Binary variable: If an observation is a white-collar worker, the variable
	"White collar" is equal to 1. Otherwise, "White collar" is equal to 0.
Full-time employment**	Binary variable: If an observation works full-time, the variable "Full-time
	employment" is equal to 1. Otherwise, "Full-time employment" is equal to 0.
More than ten years at the	Binary variable: If an observation works at the same firm for more than ten
firm**	years, the variable "More than ten years at the firm" is equal to 1. Otherwise,
-	"More than ten years at the firm" is equal to 0.
Private employment**	Binary variable: If an observation works in a private company, the variable
	"Private employment" is equal to 1. Otherwise, "Private employment" is equal
T	
Large IIrm ^{**}	Binary variable: If an observation works in a company with 1000 employees
	or more, the variable "Large firm" is equal to 1. Otherwise, "Large firm" is
M-1- J	equal to U.
iviale-dominated industry**	Binary variable: If an observation works in an industry that has male workers f_{1} for f_{2} and
	or more than 50%, the "iviale-dominated industry" is equal to 1. Otherwise,
Talouroule f:1:1:4: 1**	"Iviale-dominated industry" is equal to U.
LEIEWOTK LEASIDILITY INDEX TT	- Commons variable. A proportion of telework workers within an industry that

Variable	Definition
Telework adoption index**	Continuous variable: A proportion of telework workers within an industry that an observation is located after the pandemic.
Attitude toward women	 Continuous variable: An index measures a survey respondent's attitude toward women. It is constructed by combining the respondent's level of agreement with the following statements from the 2021 and 2022 PPS: 1. "In a recession, it is better to preserve men's jobs than it is to preserve women's jobs." 2. "If a husband has sufficient income, his wife should not work." 3. "Husbands should work outside the home, and wives should keep the household." 4. "A mother's holding a job has a negative impact on the development of primary school children "
	5. "It is more important for a wife to help her husband's career than to pursue her own career."
	Each statement receives equal weighting, normalized to 1. Therefore, the index ranges from 0 to 1, where 0 indicates an extremely liberal attitude toward women, and 1 indicates an extremely conservative attitude toward women. Since the 2018 and 2023 PPS did not measure attitudes toward women, we assume that the responses in 2021 represent the attitudes toward women in
	2018, while those in 2022 represent the attitudes toward women in 2023. Additionally, since only respondents, not their spouses, can provide the responses, we assume that the attitude represents the entire household.

Notes: * represents variables for which the 2023 PPS was not collected. ** represents variables for which the PPS also collected information from the survey respondent's spouse.