



Center for Social Research and Data Archives,  
Institute of Social Science, The University of Tokyo



CSRDA supports the Sustainable Development Goals

**SUSTAINABLE  
DEVELOPMENT  
GOALS**

# CSRDA Discussion Paper

## An Empirical Study of the Impacts of Telework during the COVID-19 Pandemic in Japan According to Company and Employee Surveys



No. <b>59</b>	Date <b>Aug.2023</b>	SDGs  
Name <b>Kazunori Minetaki, Hiroki Idota</b>		

# An Empirical Study of the Impacts of Telework during the COVID-19 Pandemic in Japan According to Company and Employee Surveys

Kazunori Minetaki, Kindai University

Hiroki Idota, Kindai University

## Summary

This study empirically analyzes the effects of telework based on the "Comprehensive Survey on Labor Management of Telework, 2020" (Ministry of Health, Labor and Welfare), which includes company and employee surveys.

According to the results of statistical analyses of a company survey, we conclude that telework impacts productivity, work-life balance (WLB), human resources management (HRM), ensuring business continuity in the event of natural disasters or infectious disease outbreaks. The effect of providing opportunities for career development, which differs in terms of creative work and routine operations, is the main contribution of this study.

Additionally, we reveal, using an employee survey, how days spent teleworking make it easier to balance work and life, and that this effect is the largest when more than 21 days are spent teleworking. We find that an improvement in ICT knowledge and skills affects the days spent teleworking and that the self-management of work hours affects WLB positively. In contrast, worrying that one's boss thinks an individual is "slacking off" (or that his or her subordinates are "slacking off") and lacking a space at home to focus on work negatively affect WLB.

Keywords: telework, autonomy, WFH, WLB, HRM

## 1. Introduction.

The purpose of this study is to examine how telework affects workplace outcomes and work-life balance and, conversely, to determine the factors that impact telework.

It has been over three years since the first new coronavirus case was confirmed in Japan in January 2020. The WHO (World Health Organization) declared the COVID-19 outbreak a global emergency on January 30, 2020. Under these circumstances, organizations had to adapt drastically, primarily, by shifting to telework (Chang et al., 2021).

Companies facing the pandemic introduced telework to ensure employee safety and continue their business. The COVID-19 crisis demonstrates how teleworking can be used by companies to ensure their employees' safety and to provide continuity to economic activity (Belzunegui-Eraso & Erro-Garcés, 2020). A company with great flexibility has a more positive impact than a company with low flexibility. The creation or adoption of a business continuity plan played a massive role in business resilience during the pandemic (Ketudat & Jeenanunta, 2021). Organizations had to implement a full-proof strategy and business continuity plan (BCP) to continue critical

business operations (Tripathi & Bagga, 2020). A competent crisis leader can implement an effective BCP to optimize the organization's overall crisis performance (Naser et al., 2019). The implementation of telework has generated both countermeasures against the COVID-19 pandemic and long-term effects. New and innovative human resources practices, in this case, telework, should not just be evaluated in terms of their potential for direct cost reduction or immediate productivity improvements, as the long-term effects on an organization's competencies are more important (Illegems & Verbeke, 2004). Indeed, the Japanese government was promoting telework even before the spread of the new coronavirus, and an increasing number of companies are currently introducing it. This attempt by the Japanese government represents a policy for promoting telework from a long-term perspective.

This study presents an empirical analysis of telework based on the "Comprehensive Survey on Labor Management of Telework, 2020" (Ministry of Health, Labor and Welfare). The data derive from two surveys: company and employee surveys conducted in 2020. The unique feature of this overall survey is thus that it can be analyzed from both the labor and management perspectives. That is, we can research the effects of telework from the perspectives of both managers and employees. The effect on the main resource domains involved, namely, the firm's human resources capital base (both in terms of strategic development and operational functioning), depends on employees' perceptions and behavior, and, therefore, employees' views on how telework affects them personally are important (Illegems & Verbeke, 2004).

The database used in this study includes several types of telework, such as paid work-from-home, satellite office, and mobile working. Next, we review the related literature on the themes that are particularly salient, specifically, productivity, work-life balance, human resource management (HRM), career development, and communication.

## 2. Literature Review

### 2-1 Telework and labor productivity

Many previous studies have researched the effect of telework on productivity. However, this effect is still debated. Kazekami (2020) analyzed the curvilinear relationship between telework hours and labor productivity and indicated that telework hours increase labor productivity. According to Shi et al. (2020), people aged 30 and above have a higher probability of reporting no change or an increase in productivity after shifting to teleworking. Respondents not living with children and, therefore, less likely to experience unexpected interruptions were more likely to report no change or increase in productivity, while those with higher educational attainment (having a graduate degree and above) also tended to report being less productive (Shi et al., 2020). Anakpo et al. (2023) revealed that the impact of telework on employee productivity depends on the nature of the work, the employer, the industry characteristics, and the home settings. Baker et al. (2007) indicated that organizational and job-related factors are more likely to affect work-from-home (WFH) employees' satisfaction and perceived productivity than work styles and household characteristics. Prasetyaningtyas et al. (2021) investigated the direct and mediating impacts of WFH on productivity through work-life balance (WLB) and job satisfaction in the banking industry in the Greater Jakarta Area. These results reveal that job satisfaction is a mediating variable between WFH and productivity and that WFH positively impacts overall productivity.

## 2-2 Telework and work-life balance

The concept of work-life balance has been recently established as a key component in the pursuit of social sustainability (Galvez et al., 2020). Additionally, many studies have argued for the effects of telework on WLB. Galvez et al. (2020) concluded that female teleworkers claim that their work-life balance is directly linked to social sustainability. Childcare is also a factor that motivates telework. Sener & Reeder (2012) have found a positive impact of the presence of children (aged less than 16 years old) on the choice to adopt telecommuting because of childcare responsibilities. Individuals with children less than five years old also have a more favorable attitude toward telecommuting (Iskan & Naktiyok, 2005). Ojala et al. (2014) demonstrated that informal overtime at home has stronger negative implications for the work-family interface, discussing how well-intentioned working schedule flexibility infringes on family life. Informal work may enable a better work-family interface, but since dual-earner employment is predominant in Finland, informal overtime work can increase pressures on families (Ojala et al., 2014). Gajendran et al. (2007) verified that high-intensity teleworking (more than 2.5 days a week) accentuated teleworking's beneficial effects on work-family conflict but harmed relationships with coworkers. Maruyama et al. (2009) revealed that controlling working hours is the most important ability for the sampled teleworkers to achieve positive WLB but that gender or having dependent children is not significant. In contrast, Hartman et al. (1991) noted a negative correlation between family disruption and telecommuting satisfaction and productivity.

## 2-3 Telework and human resource management

Additionally, the concept of HRM is important regarding the effects of telework. From the perspective of HRM, Legems & Verbeke (2004) pointed out that enhanced recruiting potential, ease of retaining highly qualified staff, and reduction in staff turnover are the impacts of telework on a firm's resource base. According to Martínez-Sánchez et al. (2007), HRM development includes employee autonomy in job design and planning, employee autonomy in job execution, employee training in the firm, or reward systems for individual employee ideas and group accomplishments; hence, the greater the access of employees to HR development in their firm is, the greater their adoption of telework. According to Illegems & Verbeke (2004), if telework can help companies attract, motivate, and retain employees whose knowledge and skills are valuable, rare, difficult to imitate, or substitute, its impact on superior performance can be enormous. Excellent employees will be attracted when such effects are achieved.

Individuals' psychological well-being increases dramatically when they experience independence and autonomy in the workplace because they must use their creativity, authority, and power to complete their work and have more chances to address stressful work situations (Illegems & Verbeke, 2004). Job autonomy increases individuals' sense of responsibility for their performance because employees who have enough independence and freedom to make decisions in their daily tasks apply their knowledge, preferences, and experiences to conduct and perform their job and even to solve difficult problems at work (Saragih et al, 2021). Telework may lead to overwork because the boundary between working time and time for life activities becomes ambiguous when schedule management is lacking. Petcu et al. (2021) have shown that job satisfaction with

telework is associated with higher skills, autonomy, and a favorable organizational climate. On the other hand, Saragih et al. (2021) found no significant relationship between job autonomy and well-being; however, there is a curvilinear relationship between job autonomy and well-being. That is, there are pros and cons to job autonomy; when the degree of job autonomy exceeds a certain point, the level of well-being declines. When employees experience an excessive degree of job flexibility, they perceive more work pressures, aggravating their job burnout, creating an opportunity for deceitful behavior, and reducing their subjective happiness (Saragih et al., 2021; Zhou, 2020; Kubicek et al., 2017). Thulin (2019), however, could not find any significant association between subjective time use control, job qualifications, and teleworking practice but suggested that family situations and having small children at home reduce time usage control. Additionally, high levels of smartphone use for work-related purposes are associated with reduced control.

#### 2-3-1. Job autonomy

Khalifa & Davison (2000) surveyed nearly 16% of 650 North American telecommuters and found that 22% disagreed that their future career development would be affected by their intention to telecommute—the worst perceived consequence. Maruyama & Tietze (2012) concluded that sales and marketing teleworkers are more likely to report reduced career visibility. In contrast, Nakrošienė et al. (2019) indicated that the suitability of the home as a workplace is associated with an increase in career opportunities.

#### 2-4. Telework and communication

Whereas teleworking eliminates a physical boundary between work and home, it creates a new physical boundary between coworkers, as they are no longer working in the same location at the same time (Greer & Payne, 2014). This decline in the opportunities for face-to-face communication alters the effects of telework. The lack of nonverbal communication and informal communication, such as a little chats in a café space in an office, is crucial; while there may be cultural differences, it is difficult to ascertain what members truly think from only the formal exchange of ideas at meetings. Reduced communication with coworkers, supervisors' trust and support, and suitability of the workplace at home were found to be the most important telework factors impacting different telework outcomes (Nakrošienė et al., 2019). Teleworkers may therefore feel lower visibility and lower supervisor support. Mutual trust, or the appropriate relationship between employee and supervisor, is needed for telework to be successful (Gajendran & Harrison, 2007; Bentley et al., 2016). Hence, it is important, although not straightforward, to build and maintain trust between supervisors and subordinates in telework, which is not a form of face-to-face communication.

### 3. Empirical analyses

As mentioned above, this study performs empirical analyses of telework based on the "Comprehensive Survey on Labor Management of Telework, 2020" (Ministry of Health, Labor and Welfare). The remarkable characteristic of this survey is that it can be used to reveal the effects of telework from both the company and employee perspectives. Table 1 provides an overview of the descriptive statistics of both questionnaires, which we assess in our empirical studies. Specifically, we statistically analyze productivity, HRM, BCP, WLB, career development,

and communication in terms of telework.

We conduct three types of empirical studies. First, based on a questionnaire survey of companies, this study investigates the effects of telework introduction and implementation, using extended ordered probit regression with the industry and the number of full-time employees as control variables, on [1] improving efficiency and productivity of routine operations; [2] improving efficiency and productivity of creative work; [3] respondents who balance work and family life and the prevention of employee turnover; [4] recruitment and retention of excellent human resources; [5] ensuring business continuity in the event of natural disasters, infectious disease outbreaks, etc. The estimation method is extended ordered probit regression because we consider the endogeneity of telework. As the variable of telework, the percentage of telework implemented is used. In the first stage, the dependent variable is the effect of telework introduction and implementation, and the explanatory variable is the percentage of telework implemented, which becomes the dependent variable in the second stage, where the main sixteen explanatory variables, controlled according to industry and company-size, are as follows: (1) external access to the company's shared servers; (2) a cloud-based file-sharing system; (3) telephones with integrated internal and external lines; (4) external access to a business e-mail address; (5) recommended use of a shared scheduler; (6) chat tools; (7) various tools for checking attendance and work status; (8) electronic files and online systems for managing time and attendance; (9) video conferencing and web conferencing; (10) a paperless office; (11) inventory and designation of tasks that can be performed through telework; (12) training for supervisors and others on how to evaluate teleworking employees; (13) opportunities for career development and skill enhancement for teleworking employees; (14) health care measures; (15) special interview guidance and consultation services for employees who telework; and (16) supplementation of communication in the workplace and within the company. These estimation results are summarized in Table 2.

In every case of [1]-[5], the percentage of telework implemented on outcomes is significant ( $p < .01$ ) at the first stage. [1] and [2] are estimations of productivity. [3], [4] and [5] concern WLB, HRM, and BCP, respectively. These results indicate that telework can affect productivity, WLB, HRM, and BCP.

In the second stage, the variables of “health care measures” and “supplementation of communication in the workplace and within the company” on the percentage of telework implemented are significant ( $p < .01$ ) in every case ([1]-[5]), and their effects are comparably large. Our results therefore suggest that companies implementing telework should make efforts to supplement communication. The variable “chat tools” is also significant ( $p < .01$ ), but its effect is small compared to the first two variables. The variables “external access to the company's shared servers” and “electronic files and online systems for managing time and attendance” affect the percentage of telework implemented at least at a 5% significance level.

The percentage of telework implemented affects two types of productivity: routine operation and creative work ([1] [2]). The marked difference between these two types of productivity is that “opportunities for career development” affects the percentage of telework implemented for creative work ( $p < .05$ ), not for routine operations. This variable related to career development is significant in the percentage of telework implemented and has almost the same coefficient regarding employees' balance of work and family life and in preventing turnover ([3]) ( $p < 0.5$ ); concerning the [4] recruitment and retention of excellent human resources, and [5] ensuring business continuity in the event of natural disasters, infectious disease outbreaks, etc., “opportunities for

career development” affects the percentage of telework implemented (respectively [4]:  $p < .1$ , [5]:  $p < .1$ ). These estimation results thus indicate that when implementing telework, a company should carefully provide opportunities for employees’ career development.

Second, we investigate the effects of days spent teleworking on how teleworking makes it easier to balance work and life based on an employee survey. The estimation method is extended ordered probit regression. In the first stage, the dependent variable is how teleworking makes it easier to balance work and life, and the main explanatory variable is the number of telework days, which is converted to a dummy variable of the number of applicable telework days, controlled by gender, age, spouse, and parenting responsibilities. In the second stage, the dummy variable for the number of telework days is the dependent variable, and the main explanatory variable is the improvement in ICT knowledge and skills of oneself or the entire workplace, controlled by industry, number of regular employees, occupation, and official position. Industry, number of regular employees, occupation, and official position are also used as dummy variables.

These estimation results are summarized in Table 3. In every case, the dummy variable for the variable of telework days is significant ( $p < .01$ ) in the first stage, and its effect on balancing work and life is the largest in the case of [13]. The effect of telework on balancing work and life is optimized when more than 21 days are spent teleworking. Improvement in the ICT knowledge and skills of oneself or the entire workplace affects the variable of days spent teleworking significantly at the second stage in the cases of [6] to [12] ([6][9][12]:  $p < .05$ , others:  $p < .01$ ). Accordingly, this finding indicates that upgrading ICT knowledge and skills, one of the factors included in HRM, can indirectly promote the balance of work and life.

Third, we investigate the effects of situations during telework on how teleworking makes it easier to balance work and life based on an employee survey. The estimation method is ordered probit regression. The dependent variable is how teleworking makes it easier to balance work and life, and the main explanatory variables are situations during teleworking, controlled by gender, age, spouse, parenting responsibilities, and the following attributes of respondents, in the form of dummy variables: industry, number of regular employees, occupation, and official position. Situations during teleworking are specified as self-management of work hours, worrying that worrying that one’s boss thinks an individual is “slacking off” (or that one’s subordinates are “slacking off”), and lacking a space at home where one can focus on one’s work. These estimation results are shown in Table 4. We find that three cases of situations during telework are significant ([14]:  $p < .01$ , [15]:  $p < .05$ , [16]:  $p < .01$ ).

Self-management of work hours, the employee autonomy included in HRM, makes teleworking more conducive to one’s work-life balance. Hence, worrying that one’s boss thinks an individual is “slacking off” (or that one’s subordinates are “slacking off”), which can be eliminated by communication and mutual trust between supervisors and subordinates, and lacking a space at home where one can focus on one’s work, which may lead to conflict at home, prevent telework from effectively balancing work and life.

#### 4. Conclusions

The results of our empirical study based on a company survey indicate that the percentage of telework implemented affects the productivity and responses by employees who must balance work and family life, the prevention of employee turnover, and the recruitment and retention of excellent human resources while ensuring

business continuity in the event of natural disasters or infectious disease outbreaks. The prevention of employee turnover, recruitment, and retention of excellent human resources are factors related to HRM. We can thus conclude that telework impacts productivity, WLB, HRM, and ensures business continuity in the event of natural disasters or infectious disease outbreaks.

Providing opportunities for career development affects the percentage of telework implemented in the case of creative work but not routine operations. This implies that highly skilled and talented employees can promote the productivity of creative work but that they need to be provided with opportunities for career development. Hence, it is important for a company to innovate by utilizing telework, a difficult business condition driven by COVID-19. Accordingly, the main contribution of this study is the effect of providing opportunities for career development, which differs in terms of creative work and routine operations.

Our empirical results based on an employee survey also reveal that days spent teleworking affect whether teleworking makes it easier to balance work and life and that this effect is the largest when the days spent teleworking are more than 21. Hence, telework can promote WLB, and the effect becomes sufficiently large when enough days are spent teleworking. Furthermore, the improvement in ICT knowledge and skills included in HRM affects the days spent teleworking when these are less than 21 days. Self-management of work hours, the employee autonomy included in HRM, affects WLB positively. In contrast, worrying that one's boss thinks an individual is "slacking off" (or that one's subordinates are "slacking off") and lacking a space at home for focusing on work affect WLB negatively. Worries about supervisors or subordinates manifest when teleworking because neither work in the same space, and they do not communicate in person. If one lacks a space at home to focus on work, one may face work-family conflict.

The limitations of this study are as follows: The focal dataset concerns only 2020. Data for 2023 or beyond are therefore needed to provide a perspective on the long-term effects of telework. In this study, the occupation of each employee is considered a control variable, whereby additional analysis by job occupation is needed. Furthermore, in examining the effects of telework on WLB, a statistical study by gender should be performed. We would like to address these issues in a future study.

#### Acknowledgments

For the secondary analysis, we obtained individual data from the "Comprehensive Survey on Labor Management of Telework, 2020" (Employment Environment and Equal Opportunity Bureau, Ministry of Health, Labor and Welfare) from the SSJ Data Archive, Center for Social Survey and Data Archive Research, Institute of Social Science, University of Tokyo. We thank the SSJ Data Archive for providing us with these data.

Minetaki exclusively analyzed the individual data and conducted the statistical analysis.



**Table 1. Descriptive statistics**

Variable	Number of Obs.	Mean	Std. Dev.	Min	Max
Improving efficiency and productivity of routine operations	1,090	0.2183	0.4133	0	1
Improving efficiency and productivity of creative work	1,090	0.1046	0.3062	0	1
Responding to employees balancing work and family life and preventing turnover	1,090	0.3468	0.4762	0	1
Recruitment and retention of excellent human resources	1,090	0.0624	0.2420	0	1
Ensuring business continuity in the event of natural disasters, infectious disease outbreaks, etc.	1,090	0.5853	0.4929	0	1
Percentage of telework implemented	1,090	3.0395	2.7456	1	9
Access to the company's shared servers from outside the company	1,090	0.7642	0.4247	0	1
Using a cloud-based file-sharing system	1,090	0.3817	0.4860	0	1
Using of telephones with integrated internal and external lines	1,090	0.1862	0.3895	0	1
Access to business e-mail from outside the company	1,090	0.7771	0.4164	0	1
The use of a shared scheduler is recommended.	1,090	0.4642	0.4989	0	1
Chat tools are used.	1,090	0.5486	0.4979	0	1
Various tools to check attendance and work status	1,090	0.2899	0.4539	0	1
Time and attendance are managed on electronic files and online systems.	1,090	0.4679	0.4992	0	1
Video conferencing and web conferencing are used.	1,090	0.7688	0.4218	0	1
Promoting a paperless office	1,090	0.4550	0.4982	0	1
Inventorying and carving out tasks that can be performed through telework	1,090	0.2532	0.4351	0	1
Training is provided to supervisors and others on how to evaluate teleworking employees.	1,090	0.0083	0.0905	0	1
Providing opportunities for career development and skill enhancement for teleworking employees	1,090	0.0376	0.1903	0	1
Health care measures are in place.	1,090	0.1679	0.3739	0	1
Special interview guidance and consultation services are provided for employees who telework.	1,090	0.0560	0.2300	0	1
Working on ways to supplement communication in the workplace and within the company	1,090	0.2817	0.4500	0	1
Dummy for industry: Mining, Quarrying, Gravel extraction=1, others=0	1,090	0.0000	0.0000	0	0
Dummy for industry: Construction=1, others=0	1,090	0.0606	0.2386	0	1
Dummy for industry: Manufacturing=1, others=0	1,090	0.2312	0.4218	0	1
Dummy for industry: Electricity, gas, heat supply, and water supply=1, others=0	1,090	0.0018	0.0428	0	1
Dummy for industry: Telecommunications industry=1, others=0	1,090	0.0697	0.2548	0	1
Dummy for industry: Transportation,Postal Service=1, others=0	1,090	0.0303	0.1714	0	1
Dummy for industry: Wholesale,Retail=1, others=0	1,090	0.1780	0.3827	0	1
Dummy for industry: Finance,Insurance=1, others=0	1,090	0.0174	0.1309	0	1
Dummy for industry: Real estate business,Goods leasing business=1, others=0	1,090	0.0174	0.1309	0	1
Dummy for industry: Lodging,Food and Beverage Services=1, others=0	1,090	0.0330	0.1788	0	1
Dummy for industry: Education, Learning support industry=1, others=0	1,090	0.0826	0.2754	0	1
Dummy for industry: Medical Care,Welfare=1, others=0	1,090	0.0743	0.2624	0	1
Dummy for industry: Other service industry=1, others=0	1,090	0.1651	0.3715	0	1
Dummy for industry: Other industry=1, others=0	1,090	0.0385	0.1926	0	1
Dummy for the number of regular employees: less than 10 persons=1, others=0	1,090	0.0110	0.1044	0	1
Dummy for the number of regular employees: 10~29 persons	1,090	0.0688	0.2532	0	1
Dummy for the number of regular employees: 30~99 persons	1,090	0.1138	0.3177	0	1
Dummy for the number of regular employees: 100~299 persons	1,090	0.3119	0.4635	0	1
Dummy for the number of regular employees: 300~499 persons	1,090	0.1771	0.3819	0	1
Dummy for the number of regular employees: 500~999 persons	1,090	0.1385	0.3456	0	1
Dummy for the number of regular employees: 1000~2999 persons	1,090	0.1202	0.3253	0	1
Dummy for the number of regular employees: 3000 persons and more	1,090	0.0569	0.2317	0	1
Teleworking makes it easier to balance work and life (1: agree - 5: disagree)	1,902	2.6067	1.2197	1	5
Gender (male=1, female=2)	1,902	1.4075	0.4915	1	2
age(20s=2,30s=3,40s=4,50s=5,60s and over=6)	1,902	3.8959	0.8126	2	6
Spouse(1: I have a spouse/partner, 2: I do not have a spouse/partner)	1,902	1.0694	0.2542	1	2
Parenting responsibilities (1: Mainly by me, 2: Equally by me and my spouse or other family members, 3: Mainly by my spouse or other family members)	1,902	2.0231	0.7693	1	3
Dummy for number of telework days in July 2020 (Number of telework days in July 2020: 1 day=1, others=0)	1,902	0.0505	0.2190	0	1
Dummy for number of telework days in July 2020 (Number of telework days in July 2020: 2-3 days=1, others=0)	1,902	0.0626	0.2422	0	1
Dummy for number of telework days in July 2020 (Number of telework days in July 2020: 4-5 days=1, others=0)	1,902	0.0510	0.2201	0	1
Dummy for number of telework days in July 2020 (Number of telework days in July 2020: 6-7 days=1, others=0)	1,902	0.0326	0.1776	0	1
Dummy for number of telework days in July 2020 (Number of telework days in July 2020: 8-10 days=1, others=0)	1,902	0.0478	0.2135	0	1
Dummy for number of telework days in July 2020 (Number of telework days in July 2020: 11-15 days=1, others=0)	1,902	0.0363	0.1870	0	1
Dummy for number of telework days in July 2020 (Number of telework days in July 2020: 16-20 days=1, others=0)	1,902	0.0221	0.1470	0	1
Dummy for number of telework days in July 2020 (Number of telework days in July 2020: 21 days and more=1, others=0)	1,902	0.0110	0.1045	0	1
Improvement of ICT knowledge and skills of yourself or the entire workplace	1,902	0.3475	0.4763	0	1
I am able to manage my working hours by myself (1: agree - 5: disagree)	629	1.8235	1.0792	1	5
I am worried that my boss might think I am slacking off (I am worried that my subordinate is slacking off) (1: agree - 5: disagree)	629	3.2687	1.3208	1	5
I don't have a space at home where I can concentrate on my work (1: agree - 5: disagree)	629	3.5596	1.3479	1	5
Dummy for occupation: Professional and Technical (medical, welfare, education)=1, others=0	1,902	0.0689	0.2533	0	1
Dummy for occupation: Professional and technical occupations(engineers, information processing, lawyers, accountants, tax accountants, etc.)=1, others=0	1,902	0.0589	0.2355	0	1
Dummy for occupation: Clerical work (personnel, labor, general affairs, accounting, etc.)=1, others=0	1,902	0.7624	0.4258	0	1
Dummy for occupation: business occupation=1, others=0	1,902	0.0652	0.2469	0	1
Dummy for occupation: sales position=1, others=0	1,902	0.0037	0.0606	0	1
Dummy for occupation: service profession=1, others=0	1,902	0.0147	0.1205	0	1
Dummy for occupation: Production site work=1, others=0	1,902	0.0074	0.0855	0	1
Dummy for occupation: Transportation and Security=1, others=0	1,902	0.0021	0.0458	0	1
Dummy for official position: general employee=1, others=0	1,902	0.3922	0.4884	0	1
Dummy for official position: Section chiefs and managers=1, others=0	1,902	0.3191	0.4663	0	1
Dummy for official position: the position corresponding to the section manager=1, others=0	1,902	0.1903	0.3927	0	1
Dummy for official position: Ministerial Equivalents=1, others=0	1,902	0.0789	0.2696	0	1

**Table 2. Estimation Results: effects of telework introduction and implementation by using the company survey**

	[1]	[2]	[3]	[4]	[5]
Dependent variable: Effects of telework introduction and implementation	Improving efficiency and productivity of routine operations	Improving efficiency and productivity of creative work	Responding to employees balancing work and family life and preventing turnover	Recruitment and retention of excellent human resources	Ensuring business continuity in the event of natural disasters, infectious disease
Percentage of telework implemented	0.2201 ***	0.2239 ***	0.2712 ***	0.1884 ***	0.1449 ***
1: 10% or less,2: about 20%,3: about 30%,4: about 40%,5: about 50%,6: about 60%,7: about 70%,8: about 80%,9: over 90	(0.0267)	(0.0280)	(0.0194)	(0.0306)	(0.0276)
Dependent variable: Percentage of telework implemented					
Access to the company's shared servers from outside the company	0.4122 ***	0.4073 **	0.4215 ***	0.4890 ***	0.5082 ***
	(0.1588)	(0.1644)	(0.1478)	(0.1571)	(0.1596)
Using a cloud-based file-sharing system	0.3630 **	0.3867 **	0.4401 ***	0.3796 **	0.3702 **
	(0.1558)	(0.1579)	(0.1437)	(0.1580)	(0.1634)
Using of telephones with integrated internal and external lines	0.3026 *	0.2437	0.2882	0.2514	0.1833
	(0.1835)	(0.1866)	(0.1773)	(0.1867)	(0.1938)
Access to business e-mail from outside the company	0.0156	-0.0005	-0.0838	0.0376	0.0335
	(0.1656)	(0.1678)	(0.1552)	(0.1681)	(0.1700)
The use of a shared scheduler is recommended.	0.4678 ***	0.4219 **	0.3926 **	0.4383 **	0.5711 ***
	(0.1652)	(0.1726)	(0.1576)	(0.1698)	(0.1767)
Chat tools are used.	0.5177 ***	0.4861 ***	0.5642 ***	0.5227 ***	0.4653 ***
	(0.1548)	(0.1617)	(0.1462)	(0.1563)	(0.1604)
Various tools to check attendance and work status	0.2627	0.1610	0.1535	0.1710	0.1129
	(0.1827)	(0.1862)	(0.1742)	(0.1873)	(0.1919)
Time and attendance are managed on electronic files and online systems.	0.4076 **	0.4493 ***	0.3726 **	0.3372 **	0.5656 ***
	(0.1649)	(0.1642)	(0.1550)	(0.1700)	(0.1637)
Video conferencing and web conferencing are used.	0.3567 **	0.5179 ***	0.4508 ***	0.4083 ***	0.5494 ***
	(0.1507)	(0.1555)	(0.1462)	(0.1530)	(0.1558)
Promoting a paperless office	0.2276	0.1333	0.2786 **	0.1484	0.0628
	(0.1486)	(0.1504)	(0.1393)	(0.1492)	(0.1525)
Inventorizing and carving out tasks that can be performed through telework	0.1889	0.1597	0.0309	-0.0034	0.1231
	(0.1755)	(0.1764)	(0.1616)	(0.1745)	(0.1816)
Training is provided to supervisors and others on how to evaluate teleworking employees.	0.0008	-0.2570	-0.5796	0.0697	-0.7173
	(1.0028)	(0.9297)	(0.8450)	(0.9557)	(0.9745)
Providing opportunities for career development and skill enhancement for teleworking employees	0.5977	0.9415 **	0.9137 **	0.7628 *	0.7501 *
	(0.3953)	(0.3927)	(0.4054)	(0.4352)	(0.4200)
Health care measures are in place.	0.9753 ***	1.1511 ***	1.0967 ***	1.1649 ***	1.1623 ***
	(0.2300)	(0.2189)	(0.2091)	(0.2217)	(0.2274)
Special interview guidance and consultation services are provided for employees who telework.	-0.4038	-0.5712 *	-0.3921	-0.3102	-0.4989
	(0.3180)	(0.2958)	(0.2611)	(0.3091)	(0.3118)
Working on ways to supplement communication in the workplace and within the company	1.0024 ***	0.9251 ***	0.9268 ***	1.0409 ***	0.7345 ***
	(0.1685)	(0.1717)	(0.1631)	(0.1783)	(0.1900)
Number of observations	1,090	1,090	1,090	1,090	1,090
Wald $\chi^2$ square	68.21	63.89	196.10	37.80	27.54
Prob > $\chi^2$ square	0.0000	0.0000	0.0000	0.0000	0.0000

\*\*\*:  $p < 0.01$ , \*\*:  $p < 0.05$ , \*:  $p < 0.1$

Robust standard errors in parentheses.

**Table 3. Estimation results: Effects on how teleworking makes it easier to balance work and life based on an employee survey**

	[6]	[7]	[8]	[9]
Dependent variable: Teleworking makes it easier to balance work and life (1: agree - 5: disagree)	Number of telework days in July 2020: 1 day	Number of telework days in July 2020: 2-3 days	Number of telework days in July 2020: 4-5 days	Number of telework days in July 2020: 6-7 days
Gender (Male:1,Female:2)	-0.0742 *** (0.0273)	-0.1077 *** (0.0371)	-0.1289 *** (0.0406)	-0.0938 *** (0.0331)
Age (1:10s, 2:20s, 3:30s, 4:40s, 5:50s, 6:60s and over)	0.0245 ** (0.0116)	0.0355 ** (0.0159)	0.0418 ** (0.0172)	0.0300 ** (0.0138)
Spouse(1. I have a spouse/partner, 2: I do not have a spouse/partner)	0.0233 (0.0290)	0.0273 (0.0398)	0.0449 (0.0463)	0.0334 (0.0364)
Parenting responsibilities (1: Mainly by me, 2: Equally by me and my spouse or other family members, 3: Mainly by my spouse or other family members)	0.0218 (0.0140)	0.0312 (0.0192)	0.0336 (0.0207)	0.0277 (0.0170)
Dummy for number of telework days in July 2020 (applicable:1, not applicable:0) ([6]-[9])	-4.3991 *** (0.2434)	-3.9536 *** (0.2178)	-4.3142 *** (0.2609)	-5.3312 *** (0.3898)
Dependent variable: dummy for number of telework days in July 2020 ([6]-[9])				
Improvement of ICT knowledge and skills of yourself or the entire workplace	0.0088 ** (0.0040)	0.0097 * (0.0050)	0.0100 * (0.0051)	0.0075 ** (0.0035)
Number of observations	1,902	1,902	1,902	1,902
Wald $\chi^2$ square	503.42	627.87	533.02	344.62
Prob > $\chi^2$ square	0.0000	0.0000	0.0000	0.0000

	[10]	[11]	[12]	[13]
Dependent variable: Teleworking makes it easier to balance work and life (1: agree - 5: disagree)	Number of telework days in July 2020: 8-10 days	Number of telework days in July 2020: 11-15 days	Number of telework days in July 2020: 16-20 days	Number of telework days in July 2020: 21+ days
Gender (Male:1,Female:2)	-0.1217 *** (0.0401)	-0.1056 *** (0.0360)	-0.1284 *** (0.0446)	-0.0756 (0.0536)
Age (1:10s, 2:20s, 3:30s, 4:40s, 5:50s, 6:60s)	0.0371 ** (0.0172)	0.0286 ** (0.0143)	0.0371 ** (0.0187)	0.0231 (0.0185)
Spouse(1. I have a spouse/partner, 2: I do not have a spouse/partner)	0.0431 (0.0500)	0.0353 (0.0413)	0.0482 (0.0528)	0.0257 (0.0325)
Parenting responsibilities (1: Mainly by me, 2: Equally by me and my spouse or other family members, 3: Mainly by my spouse or other family members)	0.0339 (0.0227)	0.0283 (0.0194)	0.0314 (0.0239)	0.0198 (0.0174)
Dummy for number of telework days in July 2020 (applicable:1, not applicable:0) ([10]-[13])	-4.5013 *** (0.2845)	-5.2558 *** (0.3421)	-6.2201 *** (0.6539)	-9.3618 *** (1.1971)
Dependent variable: dummy for number of telework days in July 2020 ([10]-[13])				
Improvement of ICT knowledge and skills of yourself or the entire workplace	0.0093 * (0.0053)	0.0071 * (0.0040)	0.0129 ** (0.0053)	0.0037 (0.0027)
Number of observations	1,902	1,902	1,902	1,902
Wald $\chi^2$ square	447.92	393.73	212.20	127.88
Prob > $\chi^2$ square	0.0000	0.0000	0.0000	0.0000

\*\*\*:  $p < 0.01$ , \*\*:  $p < 0.05$ , \*:  $p < 0.1$

Robust standard errors in parentheses.

**Table 4. Estimation results: Effects on how teleworking makes it easier to balance work and life based on an employee survey**

	[14]	[15]	[16]
Dependent variable: Teleworking makes it easier to balance work and life (1: agree - 5: disagree)	I am able to manage my working hours by myself (1: agree - 5: disagree)	I am worried that my boss will think I am skipping out. ( I am worried that my subordinates are slacking off.)(1: agree - 5: disagree)	I don't have a space at home where I can concentrate on my work (1: agree - 5: disagree)
Gender (Male:1,Female:2)	-0.3137 ** (0.1329)	-0.3264 ** (0.1320)	-0.3055 ** (0.1335)
Age (1:10s, 2:20s, 3:30s, 4:40s, 5:50s, 6:60s)	0.1017 * (0.0590)	0.1038 * (0.0589)	0.2011 *** (0.0605)
Spouse(1. I have a spouse/partner, 2: I do not have a spouse/partner)	-0.3448 (0.2328)	-0.2396 (0.2283)	-0.2640 (0.2312)
Parenting responsibilities (1: Mainly by me, 2: Equally by me and my spouse or other family members, 3: Mainly by my spouse or other family members)	0.0995 (0.0810)	0.1377 * (0.0806)	0.0637 (0.0814)
Situation during telework ([14]-[16])	0.3034 *** (0.0434)	-0.0753 ** (0.0351)	-0.3094 *** (0.0360)
Number of observations	629	629	629
LR chi2	137.84	93.45	163.59
Prob > chi2	0.0000	0.0000	0.0000
Pseudo R2	0.0840	0.0569	0.0997

\*\*\*:  $p < 0.01$ , \*\*:  $p < 0.05$ , \*:  $p < 0.1$

Robust standard errors in parentheses.

### 【References】

- Anakpo, G., Nqwayibana, Z., & Mishi, S. (2023). The Impact of Work-from-Home on Employee Performance and Productivity: A Systematic Review. *Sustainability*, 15, 4529, 1-18.
- Baker, E., Avery, G. C. & Crawford, J. (2007). Satisfaction and Perceived Productivity when Professionals Work From Home, *Research and Practice in Human Resource Management*, 15(1), 37-62.
- Belzunegui-Eraso, Angel, & Amaya Erro-Garcés. (2020). Teleworking in the Context of the Covid-19 Crisis. *Sustainability* 12: 3662, 118.
- Bentley T.A., S.T.T. Teo, L. McLeod, F. Tan, R. Bosua, & M. Gloet (2016). The role of organisational support in teleworker wellbeing: A socio-technical systems approach. *Applied Ergonomics* 52. 207-215.
- Chang, Y., Chien, C., & Shen, L. F. (2021). Telecommuting during the coronavirus pandemic: Future time orientation as a mediator between proactive coping and perceived work productivity in two cultural samples. *Personality and Individual Differences*, 171, 1-6.
- Gajendran, R. S., & Harrison, D. A. (2007). The good, the bad, and the unknown about telecommuting: Meta-analysis of psychological mediators and individual consequences. *Journal of Applied Psychology*, 92(6), 1524-1541.

- Galvez, A., Tirado, F., & Mart-nez, M.J. (2020). Work-life balance, organizations and social sustainability: Analyzing female telework in Spain. *Sustainability*, 12, 3567.
- Greer, T. W., & Payne, S. C. (2014). Overcoming telework challenges: Outcomes of successful telework strategies. *The Psychologist-Manager Journal*, 17(2), 87-111.
- Hartman Richard I., Charles R. Stoner, & Raj Arora (1991). An investigation of selected variables affecting telecommuting productivity and satisfaction. *Journal of Business and Psychology* volume 6. 207-225.
- Illegems, V., & Verbeke, A. (2004). Telework: what does it mean for management? *Long. Range Plan.* 37 (4), 319-334.
- Iscan, O.F., & Naktiyok, A. (2005). Attitudes towards telecommuting: the Turkish case. *J. Inf. Technol.* 20, 52–63.
- Khalifa, M., & Davidson, R. (2000). Exploring the telecommuting paradox. *Communications of the ACM*, 43(3), 29-30.
- Kazekami Sachiko (2020). Mechanisms to improve labor productivity by performing telework. *Telecommunications Policy* 44 .
- Ketudat, S. & Jeenanunta, Ch. (2021). Impact of the COVID-19 pandemic on logistics firms and their resilience: case studies in Thailand. *Engineering Management in Production and Services*, 13(3), 86-98.
- Kubicek, B., Paskvan, M., & Bunner, J. (2017). The bright and dark sides of job autonomy. In C. Korunka, & B. Kubicek (Eds.), *Job demands in a changing world of work* (pp. 45-63). Springer, Cham.
- Martínez-Sánchez A., Pérez-Pérez M., de-Luis-Carnicer P., & Vela-Jiménez M. (2007). Telework, human resource flexibility and firm performance. *New Technology, Work & Employment*, 22, 208-223.
- Maruyama, T. & Tietze, S. (2012). From anxiety to assurance: concerns and outcomes of telework. *Personnel Review*. Vol. 41 No. 4. 450-469.
- Naser, M., Alharthi, A. N., & Khalifa, G. S. (2019). Business Continuity Management and Crisis Leadership: An Approach to ReEngineer Crisis Performance within Abu Dhabi Governmental Entities. *International Journal on Emerging Technologies*, 10(1a), 32-40.
- Nakrošienė Audronė, Ilona Bučiūnienė & Bernadeta Goštautaitė (2019). Working from home: characteristics and outcomes of telework. *International Journal of Manpower*. Vol.40 No.1.87-101.
- Ojala, S., Nätti, J., & Anttila, T. (2014). Informal overtime at home instead of telework: Increase in negative work-family interface. *International Journal of Sociology and Social Policy* 2014, 34, 69-87.
- Prasetyaningtyas, S.W., Heryanto, C., Nurfauzi, N.F., & Tanjung, S.B.(2021). The effect of work from home on employee productivity in banking industry. *Jurnal Aplikasi Manajemen*, Volume 19, Number 3, 507-521.
- Petcu, M.A., Sobolevski-David, M.I., Anica-Popa, A., Curea, S.C., Motofei, C., & Popescu, A.M. (2021). Multidimensional assessment of job satisfaction in telework conditions. Case study: Romania in the COVID-19 pandemic. *Sustainability*, 13, 8965.
- Saragih, Susanti, Margaretha, Meily, & Anantyanda, Luthfia. (2021). JOB AUTONOMY, JOB CRAFTING AND EMPLOYEES' WELL-BEING DURING WORKING FROM HOME. *Jurnal Manajemen dan Kewirausahaan*, 23(2), 177-185.
- Sener, I.N., & Reeder, P.R. (2012). An examination of behavioral linkages across ICT choice dimensions: copula modeling of telecommuting and teleshopping choice behavior. *Environ. Plan A* 44, 1459-1478.

- Shi, Xiao, Anne Vernez Moudon, Brian H. Y. Lee, Qing Shen, & Xuegang (Jeff) Ban. (2020). Factors Influencing Teleworking Productivity – a Natural Experiment during the COVID-19 Pandemic. Findings, December 1-10.
- Thulin, E., Vilhelmson, B., & Johansson, M. (2019). New telework, time pressure, and time use control in everyday life. *Sustainability* 2019,11, 3067.
- Tripathi, A., & Bagga, T. (2020). Leveraging work from home for business continuity during COVID-19 pandemic- with reference to Bi solution adoption. *Indian Journal of Economics and Business*, 19(1), 19-34.
- Zhou, E. (2020). The “too-much-of-a-good-thing” effect of job autonomy and its explanation mechanism. *Psychology*, 11(2), 299-313.