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Uncertainty over Working Schedules and Compensating Wage Differentials: From the viewpoint of labor management

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Uncertainty over Working Schedules and Compensating Wage Differentials: From the Viewpoint of Labor Management *

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Abstract

While long working hours have attracted the attention of researchers and policymakers, studies on uncertainty over working schedules have been scarce. Using data from an originally conducted survey, this study presents empirical evidence on working schedule uncertainty in Japan. In terms of results, first, about 50% of workers have experienced unpredictable overtime work, and about 30% are occasionally forced to cancel scheduled holidays due to sudden work issues. The uncertainty over working schedules is prevalent among full-time regular employees and those working long hours. Second, the subjective cost of uncertain working schedules is large, namely, more than 150% of predicted overtime hours for the same amount of unpredictable overtime work. Third, the negative effect of uncertain working schedules on job satisfaction is far greater than that of an increase in the total amount of working hours or wage decrease. Finally, although some wage premium compensation for uncertain working schedules is observed, its size is relatively small.

Keywords: working hours, overtime, holiday, uncertainty, job satisfaction, compensating wage differential
JEL Classification: J22, J28, J31, J81, M52

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Uncertainty over Working Schedules and Compensating Wage Differentials: From the Viewpoint of Labor Management

1. Introduction

Uncertainty over working schedules, in addition to the number of working hours, have generally negative effects on work-life balance (WLB) and thus on the overall welfare of workers. Nonetheless, studies explicitly taking into account uncertain working schedules have been scarce. Using original survey data, this study contributes to filling this gap by providing empirical evidence on working schedule uncertainty.

Given the prevalence of long working hours compared to other advanced countries (Japan Institute for Labour Policy and Training, 2017), their reduction is currently an important policy issue in Japan. In this respect, policy developments aim to prevent death from overwork (*karoshi*), improve workers' health (including mental health), attain better WLB, and enhance labor productivity.

However, workers' life is also significantly affected by the unpredictability of working schedules such as sudden unexpected overtime work or difficulty in taking annual leave. The subjective costs related to private life such as children care, time spent with family members or friends, and travels, are huge. Moreover, the impact of a given amount of overtime work depends on whether the overtime is scheduled well in advance or is sudden and unexpected. At the same time, Japanese employees are known for their low utilization rate of paid annual leave (less than 50%), which may also be a result of working schedules' unpredictability.

Such an uncertainty may arise for various reasons including bad management practice. However, in order to preserve profitability or even survival, firms have often to quickly react to sudden claims from their customers and unexpected accidents. Thus, some schedule changes are unavoidable even for well-managed firms. In such a case, a compensating wage premium for the unpredicted working hours in addition to a uniform overtime pay can be considered as an economically rational solution.

In this context, this study uses data from an originally designed survey to present empirical evidence on working schedule uncertainty in Japan mainly in terms of compensating wage differentials (Rosen, 1986). While studies on working hours are abundant in the literature, working schedule uncertainty and its effects on wages and job satisfaction have not received much attention. In this regard, the findings in this study represent an insightful contribution to the literature on working hours. More specifically, we analyze (1) the frequency of unexpected overtime work and sudden cancellation of planned holidays, (2) workers' preference over

predictable working schedules, (3) the impact of working schedule uncertainty on job satisfaction, and (4) the compensating wage differential for workers accepting uncertain working schedules.

The results of our analysis are fourfold. First, about 50% of workers have experienced unpredictable overtime work, while about 30% are occasionally forced to cancel scheduled holidays due to sudden work issues. The uncertainty over working schedules is prevalent among full-time regular employees and those working long hours. Second, the subjective cost of such an uncertainty is large. As for the subjective cost of unpredictable overtime work, it is more than 150% of predicted overtime hours. The same holds for the value of secured holidays compared to uncertain holidays. Third, the negative effect of uncertain working schedules on job satisfaction is far greater than that of an increase in the total amount of working hours or a decrease in wages. Fourth, although some wage premium compensation is assigned, its size is relatively small.

The remainder of this paper is organized as follows. Section 2 briefly reviews the related literature. Section 3 describes the dataset and the methodology. Section 4 reports the results of the analysis, while Section 5 summarizes the conclusions and discusses the policy implications.

2. Literature Review

A large number of empirical studies have tackled the various aspects related to long working hours such as their effect on the productivity of workers or firms (e.g., Pencavel, 2015; Collewet and Sauermann, 2017; Lee and Lim, 2017), their relationship association with wages (e.g., Kato *et al*., 2013; Cortes and Pan, forthcoming), and their impact on subjective workers' well-being (e.g., Pouwels *et al*., 2008; Estevão and Sá, 2008; Wooden *et al*., 2009; Rätzel, 2012). In the Japanese context, some studies examine the determinants of long working hours (e.g., Kuroda and Yamamoto, 2013; Genda *et al*., 2015). However, the amount of working hours and the uncertainty over working schedules are, although related, essentially different aspects of working conditions. Indeed, it might occur that workers with short hours may face unpredictable schedules, while those with long hours may be under predictable ones.

A literature stream closely related to working schedule uncertainty is that on flexible work arrangements such as flextime, part-time, and work at home. Some studies highlight a positive willingness to pay (WTP) for jobs with flexible schedules in the US, with larger WTP among female workers than male workers (e.g., Eriksson and Kristensen, 2014; Mas and Pallais, 2017; Wiswall and Zafar, 2018). In addition, other studies show evidence of compensating wage discount for flexible working arrangements in the actual labor market (e.g., Heywood *et al*. 2007; Mas and Pallais, 2017).[1] However, schedule uncertainty cannot be completely eliminated even

[1] On the other hand, Hasebe *et al*. (2018), using survey data on Japanese individuals, report that both

under flexible work arrangements, although the chances of sudden overtime or attend on holidays are lower relative to workers with more traditional contracts.

Another relevant line of literature concerns the estimation of compensating wage premiums for shift work. For example, Kostiuk (1990) for the US and Lanfranchi *et al*. (2002) for France find relatively large wage premiums.[2] Hamermesh and Stancanelli (2015) highlight the higher incidence of night and weekend work in the US compared to continental Europe. Although shift work does not necessarily correspond to schedule uncertainty, there is interrelation, because overtime work often continues until late night, and unexpected work on holydays might coincide with weekend work.

However, these studies do not deal with working schedule uncertainty directly. The work most closely related to the current study is the one by Mas and Pallais (2017). Specifically, based on a field experiment and hypothetical questionnaire, the authors estimate the WTP for the three types of alternative work arrangements― (1) schedule flexibility, (2) work from home, and (3) irregular schedule―relative to a traditional 40 hour-per-week, Monday–Friday 9 AM–5 PM work. This study has the rare feature of estimating the WTP to avoid employers' discretion over the work schedule at a short notice (i.e., one week in advance). The estimation result indicates that the average worker is willing to give up 20% of her/his wage to avoid working hours set at a short notice, and that even workers in the first quartile of the WTP distribution are willing to give up 10% of their earnings.

To the best of our knowledge, no previous study shows evidence of the prevalence of working schedule uncertainty, the association between unpredictable working schedules and job satisfaction, and the compensating wage differential in the actual labor market after accounting for the total amount of working hours. In these respects, the present study provides an original contribution to the literature by presenting new empirical findings in the labor market.

3. Data and Methodology

3.1. Data

The data used in this study are retrieved from the "Survey of Life and Consumption under the

total working hours and wages of workers under flexible working hour arrangements are lower than those of workers under traditional working arrangements, although the differences are not statistically significant.

[2] Bøler *et al*. (2018) is a study related to this issue. They find that exporting firms exhibit a higher gender wage gap than non-exporters, because exporters may require greater commitment from their employees, such as working particular hours to communicate with trading partners in different time zones or travelling at short notice.

Changing Economic Structure" designed by the author of this paper and conducted by the Rakuten Research, Inc., which was contracted out by the Research Institute of Economy, Trade and Industry (RIETI) in 2017. The sample individuals are randomly chosen from the 2.3 million registered monitors at Rakuten Research, Inc. and are stratified by gender, age, and region (prefecture) in accordance with the Population Census in 2015 (Statistics Bureau, Ministry of Internal Affairs and Communications).[3] The number of respondents is 10,041. The distribution of the sample by individual characteristics is shown in **Appendix Table A1**. Such characteristics include gender, age, marriage status, number of family members, education, annual household income, and working status. Educational attainment is classified into seven categories.

By considering only the responses of those who are currently working, the number of observations reduces to 6,856. For currently employed individuals, wage (annual income), type of employment, occupation (one digit classification), industry (one digit classification), weekly working hours, tenure, and labor union membership are surveyed. These items are surveyed via multiple-choice questions similar to those in the Employment Status Survey (Statistics Bureau, Ministry of Internal Affairs and Communications). The classification of workers by type of employment, occupation, and industry is presented in **Appendix Table A2**. The type of employment, occupation, and industry are grouped into nine, 13, and 14 categories, respectively.

The annual earnings (tax inclusive) are classified into 18 categories: (1) less than 500 thousand yen, (2) 500 to 999 thousand yen, (3) 1 to 1.49 million yen, (4) 1.5 to 1.99 million yen, (5) 2 to 2.49 million yen, (6) 2.5 to 2.99 million yen, (7) 3 to 3.99 million yen, (8) 4 to 4.99 million yen, (9) 5 to 5.99 million yen, (10) 6 to 6.99 million yen, (11) 7 to 7.99 million yen, (12) 8 to 8.99 million yen, (13) 9 to 9.99 million yen, (14) 10 to 12.49 million yen, (15) 12.5 to 14.99 million yen, (16) 15 to 17.49 million yen, (17) 17.5 to 19.99 million yen, and (18) 20 million yen or more. The central values of these income classes are applied a logarithmic transformation to construct the variable of wages (*lnwage*).[4]

Weekly working hours (inclusive of overtime) are classified into 12 categories: (1) 15 hours or shorter, (2) 15-19 hours, (3) 20-21 hours, (4) 22-29 hours, (5) 30-45 hours, (6) 35-42 hours, (7) 43-45 hours, (8) 46-48 hours, (9) 49-59 hours, (10) 60-64 hours, (11) 65-74 hours, and (12) 75 hours or longer. The previous logarithmic transformation leads to the variable of total working

[3] To be more specific, using a software developed by the Rakuten Research, Inc., the target number of responses was set at the cell (gender*age class*prefecture) level proportional to the Population Census. Then, an invitation e-mail was sent randomly by taking account of the predicted response rate. Once the number of responses fell short of the target at the cell level, additional invitation e-mails were sent until the target number was reached.

[4] In this calculation, "less than 500 thousand yen" and "20 million yen or more" are treated as 250 thousand yen and 21.25 million yen, respectively. Mean and standard deviation of the log wages are 5.604 and 0.971, respectively.

hours (*lnhours*). [5]

The major survey items used in this study are: (1) the frequency of unexpected overtime work and sudden cancellation of planned holidays, (2) the workers' distaste for uncertain working schedules (or preference for predictable working schedules), and (3) the wage premium necessary to accept uncertain working schedules. In addition, the determinants of job satisfaction and wages are estimated by combining the responses to the questionnaire and information about job satisfaction (explained later), wages (annual income), and working hours.

The questions on the uncertainty over working schedules relate to the frequency of unexpected overtime work and that of sudden cancellation of planned holidays. The specific wording for the former is *"How often do you incur unexpected overtime?"* The choices are (1) frequently, (2) occasionally, (3) rarely, and (4) not at all. As for the uncertainty over taking holidays, the question is *"How often do you have to cancel your planned holidays because of work?"* The four choices are the same as the ones for the question on uncertain overtime.

The questions on the preference over predictability of working schedules are also about overtime and taking holidays. In the first case, the specific wording is as follows.

> *"Suppose that you are asked, all of a sudden, to put in two overtime hours. Moreover, suppose an alternative situation in which you knew in advance that you would have had to put in overtime on certain days. How much would you dislike the former situation compared to the latter? How many overtime hours would you be willing to put in if you could avoid the former? In other words, if you could avoid a situation in which you are suddenly asked to put in two hours of overtime under the condition that you agree in advance that you would accept overtime at a later date, how many extra hours would you be willing to put in?"*

Instead, wording of the question about uncertainty over taking holidays is as follows.

> *"Suppose that you can definitely take two holidays and plan them in advance. How do you value those two days if you could alternatively request more holidays on condition that you are willing to accept a forced cancellation of your holidays? In other words, in order for you to take these two holidays, how many more holidays—days that you are not certain you can take until you actually take them—would you be willing to sacrifice?"*

The responses to these questions entail writing down specific hours and days (not a multiple choice style).[6] The figures can be interpreted as the equivalent number of predictable overtime hours (unpredictable holidays) to unpredictable two hours overtime (sucured two holidays). It is natural to expect that those with a strong preference over predictability provide large figures.

The wording of the question about the wage premium necessary to accept uncertain working

[5] In this calculation, "less than 15 hours" and "75 hours or longer" are treated as 13 hours and 79.5 hours. Mean and standard deviation of the log working hours are 3.513 and 0.502, respectively.

[6] In these questions, since a preference for uncertain working schedules is unlikely, the minimum figures of the responses are set at 2 hours and 2 days, respectively.

schedules is as follows.

> *"Compare two types of jobs—those that require unexpected overtime assignments or sudden changes in your holiday plans with those that do not. Which salary increase would you expect if you were to take the former? This question assumes that overall number of working hours and the difficulty of assignments are similar for both."*

The response to this question also entails writing down a percentage, which reflects the compensating wage differential necessary to accepting uncertain schedule (willingness to accept: WTA).

Moreover, the question on job satisfaction is *"Overall, how satisfied are you with your current work?"* The five choices are (1) satisfied, (2) somewhat satisfied, (3) difficult to say, (4) somewhat dissatisfied, and (5) dissatisfied.

3.2. Methodology

This section presents the models (ordered-probit and OLS) used to explain the responses to the questionnaire by considering individual characteristics as explanatory variables. Specifically, regarding the determinants of uncertainty over working schedules (*uncertainty*), we run ordered-probit models to explain the reported frequency of unexpected overtime work and that of forced cancellation of planned holidays. In both estimations, the discrete dependent variable can take values "frequent"=3, "occasionally"=2, and "rarely" and "not at all"=1. In addition to weekly working hours (*lnhours*), the explanatory variables are dummies for females (*female*), age classes in ten-year intervals (*age*: 20-29; 30-39; 40-49; 50-59; 60-69; 70 or older), employment type (*worktype*), union membership (*union*), marital status (*married*), living with children (preschool children (*child1*), junior high school or elementary school children (*child2*), and high school student or older (*child3*)). The equation to be estimated is as follows.

$$Pr\,(uncertainty=j) = P\,(\alpha + \Sigma\, ß\, X + \gamma\, lnhours) + \varepsilon \qquad j=1, 2, 3 \qquad (1)$$

where *X* includes the explanatory variables other than working hours. The reference categories of age and employment type are 40-49 and standard full-time employee, respectively. The estimations are conducted on the full sample and on subsamples of males and females.

Regarding the preference over working schedule predictability, as most of the individual characteristics are not significantly associated with the measures of the preference for predictability, we only report means and statistics of the distribution (p10, p50, and p90) by gender

of the number of predictable overtime hours equivalent to unpredictable two-hour overtime, as well as the number of unpredictable holidays equivalent to the predictable (secured) two holidays. Similarly, we report the same descriptive statistics of the wage premium necessary to accept uncertain working schedules.

Next, we estimate other ordered-probit models to investigate the statistical relationship between working schedule uncertainty (in terms of both unpredictable overtime work and taking holidays) and a 5-point ordinal subjective job satisfaction measure, where the order of the dependent variable is reversed to "satisfied"=5, "somewhat satisfied"=4, "difficult to say"=3, "somewhat dissatisfied"=2, and "dissatisfied"=1. The main explanatory variables include dummies for "frequent" and "occasional" unexpected overtime and, alternatively, "frequent" and "occasional" cancellation of planned holidays. Here, wages (*lnwage*), working hours (*lnhours*), and individual characteristics (*X*) including gender, age classes, and employment type are used as control variables. The estimations are also performed on the two subsamples (males and females). Note that the main interests are the significance of the coefficients of the dummies for working schedule uncertainty (δ) and the size of these coefficients relative to those of total working hours and wages.

$$\begin{aligned} &Pr\ (job\ satisfaction=j) \\ &\quad = P\ (\alpha + ß\ lnwage + \gamma\ lnhours + \delta\ uncertainty + \Sigma\theta X) + \varepsilon \\ &\qquad j=1, 2, 3, 4, 5 \end{aligned} \tag{2}$$

Finally, we estimate standard wage functions that include dummies for the unpredictability of overtime work and taking holidays to test whether wage premiums compensating for working schedule uncertainty exist in the actual labor market. The dependent variable is the log annual wages (*lnwage*) and the log weekly working hours (*lnhours*) is included as a control variable. The main explanatory variables are the dummies for "frequent" and "occasional" unexpected overtime work and, alternatively, forced cancellation of planned holidays. Other explanatory variables (*X*) are dummies for age classes, tenure, education, occupation, type of employment (*worktype*), and industry (*industry*).[7] In short, the baseline equation, estimated via OLS, is expressed as follows.

$$lnwage = \alpha + ß\ lnhours + \gamma\ uncertainty + \Sigma\delta\ X + \varepsilon \tag{3}$$

These estimations are performed separately for male and female workers. The interest is in the statistical significance of the coefficients of the dummies of the working schedule uncertainty (γ), as well as the size of the wage premium in the actual labor market compared with the expressed preferences for predictability observed from the hypothetical questions, plus the impacts of

[7] Mean and standard deviation of tenure are 12.02 years and 11.09 years, respectively.

unpredictability on job satisfaction.

4. Results

4.1. Unpredictable Overtime Hours

The frequency of unpredictable overtime work by individual characteristics is reported in column (1) of **Table 1**. About 50% of workers, especially male and younger (aged 20 to 40) ones, experience unpredicted overtime work frequently or occasionally. As for the type of employment, the frequency is higher among company executives and standard full-time employees. In contrast, non-standard employees such as part-time workers, dispatched employees, and contract employees are less likely to be forced to unpredictable overtime.[8] Moreover, even when limiting the sample to standard full-time employees (not reported in the table for conciseness), a gender gap in the incidence of unpredictable overtime emerges. However, such gap is smaller than that of all workers, suggesting the different composition in the employment type as a possible explanation. The relationship between weekly working hours and the frequency of unpredictable overtime is positive, suggesting that the negative impact of long working hours on health and subjective well-being reported in past studies may derive from both the amount of hours worked and the uncertainty over working schedules.

The results of the ordered-probit estimation explaining the frequency of unpredictable overtime (equation (1)) are reported in **Table 2**. Interestingly, the coefficient for female is negative but statistically insignificant (column (1)), indicating that the observed gender gap in the working schedule uncertainty is the result of other attributes such as compositional difference in employment type and weekly working hours. Workers aged 50 or more and all types of non-standard employees are less likely to face unpredictable overtime work, suggesting that elderly and non-standard workers might self-select into jobs with predictable working schedules. Long working hours are positively associated with the frequency of unpredictable overtime, which reflects the cross-tabulation reported above.

Unexpectedly, the coefficient for union membership is positive and highly significant after controlling for the other worker characteristics including employment type. However, this positive association cannot be interpreted as causality. The coefficients for marriage status and children are generally positive but statistically insignificant, except for the coefficient for senior high school or older children among female workers (column (3)).

[8] The number of non-standard employees in Table 1 is the sum of part-time workers, hourly-paid workers, dispatched employees, contract employees, and fixed-term employees.

The summary statistics of the predictable overtime hours equivalent to the unpredictable sudden two hours' overtime are reported in **Table 3-A**. The mean is about 3.5 hours and the median (p50) is 3 hours, indicating that the subjective costs of unpredictable overtime work are 50-75% greater than the same amount of hours of predictable overtime. However, there is a large heterogeneity across individuals: the 10^{th} percentile (p10) is just 2 hours—working schedule uncertainty does not matter—while the 90^{th} percentile (p90) is 5 hours—the subjective cost of unpredictable overtime is 2.5 times greater than that of predictable overtime hours.

In the OLS estimation (not reported here), we do not detect significant differences in the equivalent hours by individual characteristics. After controlling for them, no variable exhibits a significant relationship with the equivalent hours at the 10% significance level. Thus, the difference in the subjective costs of unpredictability in overtime work cannot be explained by the observed characteristics.

4.2. Uncertainty over Taking Holidays

Column (2) of **Table 1** reports the frequency of sudden cancellation of planned holidays because of work by individual characteristics. Females, older (aged 60 or more) workers, and non-standard employees are less likely to be forced to cancel planned holidays. Similarly to overtime, those who work long hours are more likely to experience uncertainty over taking holidays.

The related ordered-probit estimation results are reported in **Table 4**. The coefficients for female, old age, and non-standard employees are negative and statistically significant after controlling for other individual characteristics. The coefficient for the number of working hours is large, positive, and highly significant, as well as the one for union membership. These results resemble those from the estimation of unpredictable overtime frequency. Unexpectedly, the coefficient for children in junior high school or elementary school as well as that for high school student or older children is positive and statistically significant. A possible explanation is that those who have these children work hard to finance education expenses.

When comparing the results of male and female subsamples (columns (2) and (3), respectively), the most remarkable difference is that, in the latter subsample, the coefficients for non-standard employment are insignificant (with the exception of dispatched employees). Since the reference category of the employment type is the standard full-time employee, an explanation might be that female standard employees are not frequently forced to cancel planned holidays relatively to the male counterpart.

The summary statistics of the number of unpredictable holidays equivalent to the predictable

two holidays are reported in **Table 3-B**. The mean and median are about 3.5 days and 3 days, respectively, indicating that the subjective benefit from predictable holidays is 50-75% larger than that from the same number of uncertain holidays. Conversely, the subjective cost of uncertainty over taking holidays is large. However, similarly to the findings on overtime work, there is a large heterogeneity across individuals: the 10th percentile (p10) is just 2 days—uncertainty over taking holidays does not matter—, while the 90th percentile (p90) is 5 days—the subjective benefit from predictable holidays is 2.5 times larger than that from unpredictable ones. Moreover, in the corresponding OLS estimation (not reported here), we do not detect significant differences by individual characteristics.

4.3. Wage Premium as Compensation for Accepting Uncertain Working Schedules

The result relating to the wage premium necessary to accept uncertain working schedules (i.e., the WTA) is summarized in **Table3-C**. The mean and the median (p50) are 27.4% and 20%, respectively. This figure is close to the one reported by Mas and Pallais (2017) for the US—20% on average. The 10th and the 90th percentile (p10 and p90) are 5% and 50%, respectively, showing relatively high individual variation.

The corresponding OLS estimation (not reported here) indicates that the differences in terms of individual characteristics, such as gender and age, are small and mostly statistically insignificant. Nonetheless, it can be observed that while the average WTA of non-standard employees is somewhat large, that of union members tends to be small. The coefficients of the dummies for unpredictable working schedules do not have a systematic relationship with the WTA: those who face greater uncertainty over working schedules do not necessarily expect a larger compensation.

To summarize, average workers value the necessary compensation for accepting uncertain working schedules as about 20-25% of their total earnings. This figure is smaller than the subjective costs or benefits expressed in terms of equivalent hours of predictable overtime to unpredictable overtime, or in terms of uncertain holidays to secured holidays previously reported (50-75%). In other words, workers do not necessarily expect a full pecuniary compensation for their distaste for working schedule uncertainty.

4.4. Uncertain Working Schedule and Job Satisfaction

This subsection reports the regression results of equation (2) on the relationship between

working schedule uncertainty and job satisfaction. **Table 5** shows the results of the ordered-probit estimation in which a 5-point scale subjective job satisfaction is used as the dependent variable. Since we assign 5 to "satisfied" and 1 to "dissatisfied," positive coefficients for the explanatory variables are associated with greater job satisfaction.

As expected, the coefficient of wages (*lnwage*) is positive, while that of working hours (*lnhours*) is negative. Both coefficients are highly statistically significant, and their magnitude is similar when both genders are considered (columns (1) and (4) of **Table 5**), implying that the effect on job satisfaction of working 1% longer and receive 1% larger earnings is almost neutral. However, when splitting the sample by gender (columns (2), (3), (5), and (6)), the coefficient of wages is smaller and that of working hours is larger in the female subsample, suggesting the presence of a relatively large negative impact of long working hours on job satisfaction. Considering the employment type, company executive and self-employed show higher subjective job satisfaction, irrespective of their gender. Among non-standard employees, the coefficients of female part-time and hourly-paid workers are positive and significant, while that of male dispatched employees is negative and significant.

The coefficients of frequent unpredictable overtime, that is, the variable of interest in this study, are negative and highly significant (columns (1) to (3)), highlighting that those who frequently face uncertain overtime work tend to be unsatisfied with their jobs, irrespective of their gender. As the model specifications include weekly working hours as an explanatory variable, the estimation results indicate an additional negative impact of schedule uncertainty after controlling for the length of overtime work.

When compared with the coefficients of working hours, the magnitude of the coefficients of frequent unpredictable overtime is very large. In terms of working hours, the negative impact of uncertainty is equivalent to triplicating the total amount of working hours.[9] This calculation suggests that, to increase workers' welfare, improving labor management to reduce uncertainty over working schedules is far more important than simply reducing the number of total working hours.

Columns (4) to (6) of **Table 5** illustrate the estimation results on the relationship between uncertainty over taking holidays and job satisfaction. The coefficients of gender, age class, employment type, wages, and working hours are essentially similar to those reported in columns (1) to (3). The coefficient of the uncertainty over taking holidays is negative and highly significant, irrespective of gender. In particular, frequent forced cancellation of planned holidays has a large negative impact on workers' job satisfaction. The coefficients' magnitude is very large relative to

[9] When compared to the magnitude of the coefficient of wages, the impact of frequent unpredictable overtime is comparable to reducing labor income by a quarter or less.

that of the coefficients of working hours or wages.[10] Thus, in order to enhance employees' job satisfaction, securing planned holidays emerges as far more important than reducing the total amount of working hours or increasing wages.

However, it should be noted that these results depend on the cross-sectional nature of the survey data. Therefore, we cannot exclude the possibility that other factors such as quality of management and labor relationships may affect both working schedule uncertainty and job satisfaction simultaneously.[11]

4.5. Compensating Wage Differential

This subsection presents the estimation results of the wage function (equation (3)), which aims to ascertain the presence of wage premium compensating for working schedule uncertainty in the actual labor market. The analysis is conducted separately for males and females. Standard measures for human capital including age, tenure, education, occupation, employment type, industry, and union membership are used as independent variables.[12] As highlighted in the previous section, the number of working hours is included as a control variable. The dummies for "frequent" and "occasional" unpredicted overtime work and, alternatively, cancellation of planned holidays are the explanatory variables of main interest.

The results are summarized in **Table 6**. The estimated coefficients of frequent and occasional unpredictable overtime are negative and significant in both subsamples (columns (1) and (3)). Interestingly, the magnitude of the coefficients is larger for female than for male workers, corresponding to wage premiums of 11-14% and 5-6%, respectively. Within the same subsample, the coefficients of "frequent" and "occasional" unpredictable overtime are similar, particularly among male workers, suggesting that the wage premiums compensating for frequent sudden overtime may not be large enough.[13] Differently from the results on overtime uncertainty, in both

[10] Through the mechanical conversion of the coefficient of frequent forced cancellation of planned holidays into that of working hours, the negative impact of holiday uncertainty is equivalent to a tenfold increase in the number of total working hours.

[11] Bloom and Van Reenen (2006) and Bloom et al. (2011), for example, indicate that firms implementing better management practices tend to provide better WLB for their employees.

[12] Unfortunately, firm-side information is limited in the survey. For example, firm size and age are not available.

[13] However, this small difference may also be the result of a subjective interpretation of the words "frequent" and "occasional." When further splitting the male and female subsamples into standard full-time employees and non-standard employees, the coefficients of unpredictable overtime, although still positive, become statistically insignificant at the 10% level. Although the lack of statistical significance may be caused by the decreased sample size, this result suggests that the wage premium for standard full-time employees, who bear a larger burden of uncertain overtime, may be reflected into the estimation results covering both standard and non-standard employees.

subsamples we do not detect significant wage premiums compensating for uncertainty over taking holidays (columns (2) and (4)).

The larger compensating wage differential for female workers needs further attention. Indeed, the result indicates that the positive impact on wages of accepting unpredictable overtime is stronger for females than for males. This finding is in line with Kato *et al*. (2013), which indicate that, in a large Japanese firm, female employees need to signal their commitment through long working hours in order to get promoted. The result of the present study reinforces their idea that not only working long hours, but also accepting unpredictable overtime work affects labor market outcomes for female employees.

To summarize, while we detect some wage premium compensation for uncertain working schedules, the size of such premium is small compared with the disutility from uncertain working schedules and the desired level of compensation.

5. Conclusion

Despite the importance of predictability of working schedules on workers' well-being, research directly dealing with the uncertainty over working schedules has been scarce compared to that on the total number of working hours. This study, focusing on unpredictable overtime work and forced cancellation of planned holidays, fills this gap by using originally designed survey data on Japanese individuals. The main findings can be summarized as follows.

First, about 50% of workers have experienced unpredicted overtime work, and about 30% are occasionally forced to cancel scheduled holidays due to sudden work issues. The uncertainty over working schedules prevails among standard full-time employees and those working long hours. The uncertain working schedules may affect females' selection of employment type. Second, workers have a strong preference for schedule predictability, which is expressed by high subjective costs of uncertainty. Third, the negative effect of uncertain working schedules on job satisfaction is far greater than that of an increase in total amount of working hours or a wage decrease. Fourth, although some wage premium compensation for uncertain working schedules is observed, its size is relatively small.

These results highlight that, from the viewpoint of workers' well-being including WLB, dealing with working schedule uncertainty is more important than simply reducing the number of total working hours or increasing wages. In this respect, labor management aimed to lessen such an uncertainty by correcting irrational business practices and/or to contain the negative impact of unavoidable schedule uncertainty is necessary. At the same time, when designing and executing the "equal pay for equal work" principle, the large negative costs to accept an uncertain schedule

should be taken into account.

While this study presents several new findings, its reliance on a cross-sectional data represents an obvious limitation. The availability of longitudinal data to enable deeper analysis (e.g., to detect causal relationships) is expected. In addition, as the information on uncertainty over the working schedule is subjective and qualitative, we cannot exclude possible measurement errors. Finally, the results presented in this study are limited to Japan. By considering the large impact of working schedule uncertainty on workers' well-being, international comparisons should be clearly put in the agenda for future research.

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Table 1. Frequency of Unpredictable Overtime and Holidays Cancellation

	(1) Unpredictable overtime		(2) Unpredictable cancellation of holidays	
	Frequently	Occasionally	Frequently	Occasionally
All	14.0%	38.3%	5.2%	23.4%
Male	16.3%	41.3%	6.6%	27.8%
Female	10.8%	34.2%	3.2%	17.3%
Age 20-29	18.2%	43.0%	5.6%	23.7%
30-39	19.4%	45.3%	7.2%	26.8%
40-49	17.4%	42.6%	6.1%	26.8%
50-59	11.9%	40.3%	4.7%	24.3%
60-69	5.2%	24.4%	2.5%	16.6%
70-	5.0%	19.5%	4.4%	13.2%
Company executive	24.7%	33.2%	11.6%	27.8%
Self-employed	10.4%	31.9%	7.0%	28.5%
Standard employee	18.4%	47.2%	6.3%	28.5%
Non-standard employee	7.1%	27.9%	1.9%	13.7%
Less than 35 hours	7.3%	26.8%	2.5%	14.9%
35-42 hours	5.8%	39.0%	1.8%	20.7%
43-45 hours	14.6%	51.5%	5.0%	27.7%
46-48 hours	20.3%	54.0%	5.2%	35.1%
49-59 hours	31.3%	46.3%	10.4%	33.1%
60-64 hours	32.0%	44.0%	13.9%	37.6%
65-74 hours	40.9%	41.7%	22.8%	40.9%
75 hours or more	49.7%	34.3%	30.2%	37.9%

(Note) The figures are the percentages of respondents that answered “frequently” and “occasionally” to the questions on uncertainty over working schedules. The total number of observations is 6,856.

Table 2. Individual Characteristics and the Frequency of Unpredictable Overtime

	(1) All	(2) Male	(3) Female
Female	-0.0317		
	(0.0332)		
20-29	0.0944 *	0.0571	0.1793 **
	(0.0496)	(0.0663)	(0.0757)
30-39	0.0919 **	0.0907	0.1154
	(0.0448)	(0.0588)	(0.0707)
50-59	-0.1943 ***	-0.2883 ***	-0.0803
	(0.0442)	(0.0580)	(0.0691)
60-69	-0.5601 ***	-0.6711 ***	-0.3945 ***
	(0.0506)	(0.0703)	(0.0747)
70-	-0.5699 ***	-0.5469 ***	-0.6389 ***
	(0.1179)	(0.1441)	(0.2175)
Company executive	0.2071 ***	0.2359 ***	0.1681
	(0.0703)	(0.0814)	(0.1472)
Self-employed	-0.1152 **	-0.1268 *	-0.0785
	(0.0540)	(0.0649)	(0.1012)
Family worker	-0.4955 ***	-0.5728 ***	-0.4647 ***
	(0.1152)	(0.1845)	(0.1437)
Part-time worker	-0.2570 ***	-0.3395 ***	-0.2413 ***
	(0.0519)	(0.1174)	(0.0640)
Hourly paid worker	-0.3190 ***	-0.3642 ***	-0.2646 **
	(0.0748)	(0.1041)	(0.1076)
Dispatched employee	-0.2218 **	-0.1280	-0.2236 **
	(0.0907)	(0.1507)	(0.1125)
Contract employee	-0.2344 ***	-0.3068 ***	-0.1219
	(0.0677)	(0.0995)	(0.0934)
Fixed-term employee	-0.6544 ***	-0.9162 ***	-0.3707 **
	(0.1283)	(0.1964)	(0.1725)
Union	0.1839 ***	0.1800 ***	0.1904 ***
	(0.0349)	(0.0447)	(0.0571)
Married	0.0344	0.0717	0.0112
	(0.0362)	(0.0523)	(0.0519)
Child1	0.0729	0.0816	-0.0013
	(0.0502)	(0.0645)	(0.0834)
Child2	0.0571	0.0416	0.0516
	(0.0455)	(0.0583)	(0.0754)
Child3	0.0831 **	0.0388	0.1481 **
	(0.0399)	(0.0528)	(0.0614)
lnhours	0.5854 ***	0.6471 ***	0.5110 ***
	(0.0380)	(0.0506)	(0.0592)
Observations	6,856	3,975	2,881
Pseudo R^2	0.0939	0.1008	0.0718

(Notes) Ordered-probit estimation results with robust standard errors in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. The reference categories are age 40-49 and standard full-time employee.

Table 3. Preference for Predictable Working Schedules

		Mean	P10	P50	P90
A. Overtime	All	3.47	2	3	5
	Male	3.51	2	3	5
	Female	3.40	2	3	5
B. Holiday	All	3.45	2	3	5
	Male	3.42	2	3	5
	Female	3.49	2	3	5
C. Compensating wage premium	All	27.4	5	20	50
	Male	27.0	5	20	50
	Female	28.0	10	20	50

(Note) The figures in row A indicate the predictable overtime hours equivalent to the unpredictable sudden two-hour overtime. The figures in row B indicate the number of unpredictable holidays equivalent to two predictable holidays. The figures in row C indicate the desirable wage premium (%) necessary to accept an uncertain working schedule (WTA).

Table 4. Individual Characteristics and Uncertainty over Taking Holidays

	(1) All	(2) Male	(3) Female
Female	-0.1782 ***		
	(0.0374)		
20-29	0.0110	-0.0346	0.0954
	(0.0560)	(0.0715)	(0.0911)
30-39	0.0718	0.0657	0.1087
	(0.0502)	(0.0640)	(0.0828)
50-59	-0.1057 **	-0.1365 **	-0.0748
	(0.0495)	(0.0609)	(0.0866)
60-69	-0.3012 ***	-0.3411 ***	-0.1823 **
	(0.0555)	(0.0725)	(0.0875)
70-	-0.3018 **	-0.1933	-0.5140 **
	(0.1296)	(0.1610)	(0.2287)
Company executive	0.3119 ***	0.3145 ***	0.2924 *
	(0.0709)	(0.0811)	(0.1530)
Self-employed	0.3023 ***	0.2311 ***	0.4720 ***
	(0.0559)	(0.0657)	(0.1090)
Family worker	-0.1064	-0.2670	0.0002
	(0.1363)	(0.2356)	(0.1677)
Part-time worker	-0.1961 ***	-0.4373 ***	-0.1111
	(0.0601)	(0.1361)	(0.0776)
Hourly paid worker	-0.2042 **	-0.2574 **	-0.1196
	(0.0870)	(0.1169)	(0.1311)
Dispatched employee	-0.4870 ***	-0.1781	-0.6782 ***
	(0.1139)	(0.1716)	(0.1599)
Contract employee	-0.1545 **	-0.2713 ***	0.0290
	(0.0752)	(0.1024)	(0.1128)
Fixed-term employee	-0.2941 **	-0.5549 ***	0.0415
	(0.1457)	(0.2099)	(0.2040)
Union	0.1035 ***	0.0692	0.1717 **
	(0.0394)	(0.0488)	(0.0672)
Married	-0.0163	-0.0483	0.0154
	(0.0407)	(0.0554)	(0.0629)
Child1	0.0370	-0.0019	0.1028
	(0.0578)	(0.0730)	(0.0948)
Child2	0.1401 ***	0.1509 **	0.0973
	(0.0502)	(0.0626)	(0.0875)
Child3	0.1134 **	0.1124 **	0.1367 *
	(0.0438)	(0.0554)	(0.0729)
lnhours	0.4917 ***	0.5282 ***	0.4532 ***
	(0.0443)	(0.0581)	(0.0720)
Observations	6,856	3,975	2,881
Pseudo R^2	0.0655	0.0536	0.0522

(Notes) Ordered-probit estimation results with robust standard errors in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. The reference categories are 40-49 and standard full-time employee.

Table 5. Uncertainty over Working Schedules and Job Satisfaction

	(1) Male	(2) Female	(3) Male	(4) Female
lnwage	0.2149 ***	0.1685 ***	0.2179 ***	0.1581 ***
	(0.0288)	(0.0325)	(0.0289)	(0.0325)
lnhours	-0.1800 ***	-0.2937 ***	-0.1697 ***	-0.2918 ***
	(0.0434)	(0.0537)	(0.0433)	(0.0532)
Occasional	0.0313	-0.0724		
unpredictable overtime	(0.0385)	(0.0446)		
Frequent unpredictable	-0.2786 ***	-0.3666 ***		
overtime	(0.0570)	(0.0742)		
Occasional cancellation			-0.1463 ***	-0.1178 **
of holidays			(0.0380)	(0.0531)
Frequent cancellation			-0.5339 ***	-0.5448 ***
of holidays			(0.0827)	(0.1266)

(Notes) Ordered-probit estimation results with robust standard errors in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. The reference categories are the responses “rarely” and “not at all.”

Table 6. Estimated Wage Functions

	(1) Male	(2) Male	(3) Female	(4) Female
Occasional	0.0560 **		0.1088 ***	
unpredictable overtime	(0.0231)		(0.0255)	
Frequent unpredictable	0.0531 *		0.1266 ***	
overtime	(0.0287)		(0.0441)	
Occasional cancellation		0.0042		0.0427
of holidays		(0.0224)		(0.0304)
Frequent cancellation		0.0293		-0.0442
of holidays		(0.0419)		(0.0764)
lnhours	yes	yes	yes	yes
Age	yes	yes	yes	yes
Tenure	yes	yes	yes	yes
Education	yes	yes	yes	yes
Occupation	yes	yes	yes	yes
Type 0f employment	yes	yes	yes	yes
Industry	yes	yes	yes	yes
Union	yes	yes	yes	yes
Observations	3,975	3,975	2,881	2,881
Adj. R^2	0.4905	0.6152	0.6228	0.6248

(Notes) OLS estimation results with robust standard errors in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. The reference categories are the responses “rarely” and “not at all.”

Appendix Table A1. Composition of the Respondents

	(1) All		(2) Engaged in work	
All	10,041	100.0%	6,856	100.0%
Male	4,973	49.5%	3,975	58.0%
Female	5,068	50.5%	2,881	42.0%
Age 20-29	1,329	13.2%	1,020	14.9%
30-39	1,630	16.2%	1,272	18.6%
40-49	2,013	20.0%	1,647	24.0%
50-59	1,641	16.3%	1,308	19.1%
60-69	2,796	27.8%	1,450	21.1%
70-	632	6.3%	159	2.3%
Primary school or junior high school	218	2.2%	113	1.6%
Senior high school	2,864	28.5%	1,751	25.5%
Vocational school	1,086	10.8%	790	11.5%
Junior (2-year) college	1,287	12.8%	773	11.3%
(4-year) college or university	4,060	40.4%	2,984	43.5%
Graduate school (master's course)	417	4.2%	355	5.2%
Graduate school (doctoral course)	109	1.1%	90	1.3%
Not married	3,499	34.8%	2,668	38.9%
Merried	6,542	65.2%	4,188	61.1%
Preschool children	1,076	10.7%	771	11.2%
Junior high school or elementary school children	1,049	10.4%	868	12.7%
Senior high school student or older	2,072	20.6%	1,404	20.5%

Appendix Table A2. Working Individuals by Employment Type, Occupation, Industry, and Union Membership

		Number of sample	(%)
All working individuals		6,856	100.0%
Emplyment type	Company executive	352	5.1%
	Self-employed	673	9.8%
	Family worker	126	1.8%
	Standard full-time employee	3,464	50.5%
	Part-time worker	1,128	16.5%
	Hourly paid worker	408	6.0%
	Dispatched employee	199	2.9%
	Contract employee	378	5.5%
	Fixed-term employee (*shokutaku*)	128	1.9%
Occupation	Administrative & managerial	747	10.9%
	Professional & engineering	1,650	24.1%
	Clerical	1,514	22.1%
	Sales	374	5.5%
	Trade	447	6.5%
	Service	1,033	15.1%
	Security	83	1.2%
	Agriculture/forestry/fishery	54	0.8%
	Manufacturing process	286	4.2%
	Transport & machine operation	82	1.2%
	Construction & mining	73	1.1%
	Carrying/cleaning/packaging	156	2.3%
	Other occupations	357	5.2%
Industry	Agriculture, forestry, and fishery	76	1.1%
	Construction	403	5.9%
	Manufacturing	1,163	17.0%
	Information & communications	290	4.2%
	Transport	262	3.8%
	Wholesale & retail	728	10.6%
	Finance & insurance	282	4.1%
	Real estate	186	2.7%
	Accommodations & restaurants	187	2.7%
	Health care & welfare	775	11.3%
	Education	464	6.8%
	Other services	1,313	19.2%
	Public services	432	6.3%
	Other industries	295	4.3%
Union member		1,517	22.1%