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Evidence from longitudinal Japanese firm data^{*}

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Abstract

This study focuses on firms' profit rate, instead of conventional self-reported subjective indices, to objectively assess the total impact of employees' mental illness on firm performance. We found the following results from a unique data set obtained by linking Japanese firms' 2004-2014 financial data to longitudinal information on their workers' mental health. First, long work hours have a small but significant effect on employee' mental health. Second, firms with higher sick leave or turnover rate of employees with mental disorders tend to have lower annual profit rates even after controlling for unobservable firm heterogeneity. These findings imply that the percentage of employees who take sick leave or leave firms due to bad mental health is the tip of the iceberg and should be considered as a proxy variable for the mental health of a firm's employees. Third, the negative effect of workers' bad mental health on firm performance is greater for firms with high fixed employment costs. These facts indicate that keeping employees' mental health in good condition is beneficial not only for employee welfare but also from a business perspective.

Keywords: Mental health, Profit rate, Fixed employment cost

JEL classification: I12, J22, J81

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^{*} This study is conducted as a part of the Project "Labor Market Analysis Using Matched Employer-Employee Panel Data" undertaken at Research Institute of Economy, Trade and Industry (RIETI). This study utilizes the micro data of the questionnaire information based on "the Basic Survey of Japanese Business Structure and Activities" which is conducted by the Ministry of Economy, Trade and Industry (METI), and the "Survey of Companies and Employees on Human Capital Development and Work-Life Balance" which was conducted by RIETI. The authors are grateful for helpful comments and suggestions by Masahisa Fujita, Masayuki Morikawa, Yukiko Saito, Youichi Sekizawa and Kotaro Tsuru and Discussion Paper seminar participants at RIETI.

I. Introduction

Confronting mental illness of the working-age population is becoming a key issue for labor market and social policies in many countries (OECD 2012). According to the National Institute of Mental Health, for example, an estimated 43.8 million U.S. adults aged 18 years or older, representing 18.5 percent of all U.S. adults, suffered from some kind of mental illness in 2013. OECD (2012) also reports that on average around 20 percent of the working-age population in OECD countries suffer from a mental disorder in a clinical sense. Eriksson (2012) indicates accumulating evidence of a decline in the level of individuals' psychological well-being, especially in the more advanced industrialized societies (e.g., see Sacker and Wiggins [2002] and Green et al. [2014] for the U.K. and Verhaak et al. [2005] for the Netherlands), and points out that modern workplace conditions are an important contributory factor. Although mental illness has become a growing concern for many advanced economies, researchers are yet to investigate a number of issues, especially the connection between mental health and work.

Unlike conventional approaches, this paper tries to add new evidence to the previous literature that discusses the relationship between mental health and work, especially from the perspective of firm performance. In the previous literature, two approaches were mainly adopted to investigate how poor mental health would affect workers' productivity: i) *absenteeism* (sickness absence); and ii) *presenteeism* (reduced productivity because of health problems of employees present in the workplace). Earlier studies had mainly focused on absenteeism by directly calculating the number of days lost due to sick leave taken by workers because of mental illness (see, for example, Stewart et al. [2003] for US estimates). Recently, however, presenteeism has been gradually recognized as a potentially much more serious problem than absenteeism. This may be due to the widespread social stigma attached to mental illness, which

causes workers to disguise their mental health problems for fear of demotion, dismissal, shame, or even other reasons.¹

In most previous studies, the costs of presenteeism are estimated according to subjective indices calculated from a questionnaire in which employees self-report their own productivity levels.² Such subjective indices, however, may not correctly represent the full impact of workers' mental illness on firm performance, at least for the following reasons. First, self-reported answers are highly subjective, and productivity loss may be underreported because of social stigma. Second, the conventional method of summing up individual productivity losses does not consider the direct and indirect costs of covering up mental illness of workers. Employers may have to hire additional staff. Colleagues may also have to do extra tasks and work additional hours to cover the loss, probably causing secondary harm to their mental health. Third, when team work is necessary, the productivity of the team as a whole may also decline if one of the team members' productivity is low due to mental illness, even if no harm occurs to other team members' mental health. Lastly, a negative spillover effect on workers' motivation³ or atmosphere of workplace may reduce the productivity of the workplace as a whole.

Given these viewpoints, this study focuses on the firm's profit rate, instead of self-reported subjective indices, to objectively assess the total impact of employees' mental illness on firm performance, using financial information in firm-level panel data. To our knowledge, no studies statistically examine the influence of workers' mental health on firms' financial performance measures. Specifically, we use a unique data set

¹ Bharadwaj, Pai, and Suziedelyte (2015), for example, find that survey respondents misrepresent mental health status because of social stigma 36 percent of the time when asked about diagnosis and about 20 percent of the time when asked about prescription drug use.

² OECD (2012) estimates from Eurobarometer data that because of their health problems workers with severe mental disorders are more than three times as likely as those without any such disorder to accomplish less than they would like to. The paper also points out that workers' self-reported productivity has fallen over time, especially among workers with either a severe or common mental disorder.

³ Recently, a growing body of literature has emerged that focuses on the concept of *work engagement*. Work engagement consists of three factors: dedication, absorption, and vigor toward one's job. It has been said that increasing work engagement may not only improve workers' mental health but also lead to better firm performance because of the workers' increasingly positive attitude toward work (Schaufeli et al. 2002). Both Xanthopoulou et al. (2009) and Salanova, Agut, and Peiro (2005) report that higher work engagement results in both higher sales and higher customer satisfaction.

obtained by linking 2004–2014 financial data of Japanese firms to longitudinal data on their workers' mental health. In the estimation, we control for unobservable individual firm heterogeneity and other factors. We also consider the possibility of reverse causality in which firm performance affects employees' mental health.

In the following analysis, we use each firm's following two rates of employees with mental illness as a proxy variable for the average mental health of all employees who work at the firm. The two rates are: (i) the ratio of employees absent from work for mental health reasons for more than a month to total employees (hereafter, sick-leave rate) and (ii) the ratio of employees who left the firm due to mental disorders to total employees (hereafter, turnover rate). Bergström et al. (2009) show that presenteeism is a risk factor for general health in the future. In other words, people at work who disguise their illness have a high risk of future sick leave. Given this fact, we assume that if a certain percentage of people at a firm take sick leave due to mental illness, the firm may also experience a certain amount of presenteeism. We also use the turnover rate for mental illness as another proxy since, at a certain point, a worker needs to leave the firm if he/she does not recover from the illness. Using these variables as proxies for the average degree of mental illness of the workers at a firm, we investigate how workers' mental health affect firm performance. In addition, we also investigate the effectiveness of mental health measures taken by firms as well as how work hours would affect workers' mental health.

Our main findings are as follows. First, long work hours have a small but significant effect on employees' mental health. Second, firms with higher sick-leave ratio or turnover rate of employees with mental disorders tend to have lower annual profit rates ratios. These findings imply that the percentage of employees who are found to take sick leave or quit due to bad mental health is the tip of the iceberg, and should be considered a proxy variable for the mental condition of all employees of the firm. Third, those negative effects are greater for firms with high fixed employment costs. These facts indicate that keeping employees' mental health in good condition is beneficial not only for employees' welfare but also from a business perspective.

The rest of this paper is organized as follows. In the next section, we present the empirical specifications. Section III briefly describes Japan's recent mental health situation and explains the data used for this study as well as the basic characteristics of the data. Section IV investigates the relationship between employees' mental health and work-related factors, such as hours of work and the firm's mental health measures and human resource management (hereafter, HRM) practices. Section V examines the relationship between employees' mental health and firm performance. Section VI concludes the study.

II. Empirical specifications

We first investigate how employees' mental health can be affected by workplace factors, including work hours and firms' mental health measures and HRM practices. Subsequently, we estimate how that could influence firm performance. Using the longitudinal data as explained in the next section, we estimate the following two equations as a fixed effect model:

$$MH_{it} = \alpha_1 + \mathbf{z}_{it}\boldsymbol{\alpha}_2 + \mathbf{x}_{it}\boldsymbol{\alpha}_3 + f_i^m + \varepsilon_{it}, \quad (1)$$

$$ROS_{it} = \beta_1 + \beta_2 MH_{it} + \mathbf{x}_{it}\boldsymbol{\beta}_3 + f_i^r + v_{it}, \quad (2)$$

where MH_{it} is a variable indicating employees' mental health for firm i in year t , such as sick-leave and turnover rates of employees with mental disorders, ROS_{it} is the return on sales (ordinary profit divided by total sales), \mathbf{z}_{it} is a vector of variables, including average weekly work hours and dummy variables for the firm's employee mental health measures and HRM practices, \mathbf{x}_{it} is a vector of control variables such as the number of employees and year dummy variables, f_i^m and f_i^r are individual firm heterogeneities, and ε_{it} and v_{it} are error terms.

As for firms' measures against mental illness in vector \mathbf{z}_{it} , we employ the following four popular measures adopted in many Japanese firms: (1) mental health training and knowledge transfer to managers, (2) employer-employee health committee to discuss workplace mental problems, (3) employees' stress surveys, and (4) work environment assessment. In vector \mathbf{z}_{it} , we also include the following HRM practices: (5) introduction of flextime system, (6) establishment of a dedicated section for work-life balance (hereafter, WLB) practice, (7) organizational efforts to reduce overtime, and (8) introduction of performance-based pay system. We conjecture that not only hours of work but also workplace practice or HRM could be associated with employees' mental health. Each of the above-mentioned eight practices is transformed into a dummy variable that takes 1 if the firm already adopted it in the previous year, and 0 if not. Information up to the previous year is used to account for possible endogeneity from previous adoption of the practice.

When estimating equation (2), it is important to consider a possible endogeneity for employees' mental health, MH_{it} . While employees' mental disorders could affect firm performance, firm performance may also affect the mental health of employees at the same time since better firm performance could lead to a large increase in the employee's wage and/or better workplace atmosphere. To tackle this issue, we employ a fixed effect model to control for time-invariant firm heterogeneity. As long as better firm performance is brought about by time-invariant factors such as large financial power and managerial effectiveness, the fixed effect model can manage to account for endogeneity.

To account for possible endogeneity brought about by time-variant factors, we considered it necessary to use instrument variables that correlate with employees' mental health but not with firm performance, directly. Therefore, after testing for endogeneity of mental health in equations (1) and (2), we also use firms' work hours, mental health measures, and HRM practices in \mathbf{z}_{it} as fixed-effect instrumental variables.

III. Brief background of the situation in Japan and data

1. Situation in Japan

Before turning to our analysis, we briefly discuss the recent mental health issues in Japan based on official statistics.

Similar to many industrialized countries, the number of people suffering from mental illness has been increasing in Japan. In Figure I, we plot the number of patients with mental disorder over two decades based on *Patient Survey* (Ministry of Health, Labour and Welfare). From the figure, the number of people suffering from mental illness in a clinical sense has increased, especially in the last decade. In particular, the percentage of people suffering from mood disorder (including depression and bipolar disorder) increased over the period. Note that the slight decline in the 2011 survey is due to the fact that patients residing in three prefectures that were severely damaged by the Great East Japan Earthquake were excluded from the data. Thus, the number would have been much larger but for the earthquake.

In Figure II, we plot the number of applications and the number of approved claims for insurance due to industrial accidents from workers' compensation insurance data (provided by the Ministry of Health, Labour and Welfare). While the total number of claims for physical diseases, like those affecting the brain and heart, has been stable since 2000, the total number of claims for mental disorders increased steadily during that time. Claims for mental disorder include suicides presumably triggered by mental disorder.

In the meantime, the total number of suicides has also increased rapidly, from around 25,000 in the end of the 1990s to 35,000 in the 2000s. The Japanese government estimates that the economic and social loss from suicides and mental disorders was at least 2.7 trillion yen for 2009, which is equivalent to 0.7 percent of GDP⁴ (Kaneko and Sato 2010).

⁴ Note that this calculation does not include the economic loss from presenteeism. Gustavsson et al. (2011) estimate that, in the Euroarea, the economic loss due to mental disorders range from three to four percent of GDP.

2. Data and its characteristics

Our data are from the Survey of Companies and Employees on Human Capital Development and Work-Life Balance, an original firm survey conducted by the Research Institute of Economy, Trade and Industry (RIETI). A special feature of this survey is that it contains longitudinal mental health information on firms, such as information on mental health measures and HRM practices of each firm as well as sick-leave and turnover rates of employees with mental illness, as explained further in the following paragraph.

The survey was launched from January to February in 2012, and consecutive surveys were conducted at same time each year from 2013 to 2015. In the first wave, 719 out of 5,677 firms responded (a response rate of 12.7 percent). In the second and third waves, 446 out of 719 (a response rate of 62.0 percent) and 356 out of 446 firms responded (a response rate of 79.8 percent), respectively. In the third wave, new firms were added for sample refreshment, and 1,237 out of 8,121 firms responded (a response rate of 15.2 percent). In the fourth wave, 400 of 1,593 surveyed firms responded (a response rate of 25.1 percent). In the fourth wave, 848 firms were added for sample refreshment from 10,000 surveyed firms (a response rate of 8.5 percent).

In the panel survey, firms were asked to provide two ratios: (i) the ratio of employees absent from work for mental health reasons for more than a month to total employees (hereafter, sick-leave rate) and (ii) the ratio of employees who left the firm due to mental disorders to total employees (hereafter, turnover rate). In 2004, 2007, 2009, and 2011, these ratios were also required as retrospective information, in addition to information for the surveyed years, in the second, third, and fourth waves. From this information, we can compile panel data of sick-leave and turnover rates of each firm for seven years: 2004, 2007, 2009, 2011, 2012, 2013, and 2014.

The first and third waves can be matched to the Japanese government's official survey called the Basic Survey of Japanese Business Structure and Activities (hereafter, BSBA), conducted by METI. The BSBA is an annual firm panel survey that collects,

since 1991, representative statistics of Japanese firms with 50 or more regular employees. The industries surveyed include mining, manufacturing, electricity and gas utilities, wholesale trade, retail, and several other service industries (for more details on the BSBA, see Morikawa [2011]). In addition, the refreshment sample in the fourth wave can be linked to the Tokyo Shoko Research (TSR) database. TSR is a major credit reporting and business database company in Japan. The TSR database contains firms' financial statements and covers more than 1.2 million Japanese firms nationwide.

Matching the original firm survey data mentioned above to the BSBA and TSR data gives the basic financial database such as profit and loss statements. From the financial database, we calculate firms' annual profit rate (return on sales [ROS], i.e., ordinary profit divided by total sales) to represent firms' financial performance. After excluding outliers and missing values, as well as respondent firms in the original survey that did not match with the BSBA and TSR database, we obtained 8,128 total observations from 2,571 firms with more than 50 employees for the estimation.

3. Descriptive statistics

The descriptive statistics for the variables used in the estimation are summarized in Table I. The indices of employees' mental disorders (sick-leave and turnover rates for mental disorders) are not very high—at most 0.56 percent on average—although both rates exhibit increasing trends over the years. As discussed in the Introduction, we regard these rates as proxy variables to capture the mental health of all employees, and see whether workers' mental health affects firm performance.

In addition, Table I indicates an overall increasing trend in the implementation of mental health measures and HRM practices by firms. The table also shows that the average ROS dropped significantly in 2009, possibly because of the global financial crisis in 2008.

IV. Determinants of employees' mental health status

1. Graphical Analysis

In this section, we examine how employees' mental health could be affected by workplace factors, including work hours, firm's coping measures for employee's mental disorders, and HRM practices.

International comparison shows that Japan is one of the top long-working countries in the OECD (OECD 2010), and long working hours have been widely believed to harm workers' mental health. To check this point, Figure III shows sick-leave and turnover rates for mental disorders (levels and changes from two years ago) for firms grouped by average work hours of full-time employees. Along with the increase in work hours from less than 40 to 50–55 hours, both sick-leave and turnover rates as well as changes in the rates tend to rise. We note, however, that this tendency disappears beyond 50–55 hours. In the following analysis, we check for this relationship controlling for firm heterogeneity.

In Figure IV, we see the relationship between changes in employees' mental health over two years until the present and four mental health measures implemented by firms. In the figure, we categorize firms into "Yes" and "No" groups depending on whether or not they implemented mental health measures before the two-year period in order to account for reverse causality. If these measures are effective, we could expect firms that implemented these measures to have lower sick-leave and turnover rates than those that did not. However, Figure IV shows the opposite tendency.

Similar patterns are also found in Figure V, where we plot changes in the sick-leave and turnover rates due to HRM practices. The ratio differences between implementing and non-implementing firms are small for HRM practices compared to mental health measures, especially for the flextime system and establishment of a dedicated section for employees' WLB. By controlling for other factors in the regression analysis below, we examine whether these measures and policies effectively improve workers' mental health.

2. Regression Analysis

We estimate equation (1) by a fixed effect model by controlling for other factors to examine the relationship illustrated in Figures III to V. The estimation results are shown in Table II.⁵ Since the Hausman test supports fixed effect over random effect models, we show only the fixed effect estimation results. The table shows the estimation results based on (i) the total sick-leave and turnover rates of employees with mental disorders, (ii) the sick leave rate, and (iii) the turnover rate as dependent variables representing workers' mental health.

From the estimated coefficients of weekly average work hours, we confirm that work hours would increase the total sick-leave leave and turnover rate at the 10 percent significance level. We note, however, that the impact of work hours is relatively small; the estimated coefficient indicates that a ten-hour increase in work hours would raise the total ratio by only 0.06 percent. Furthermore, the coefficients of work hours become insignificant when sick-leave and turnover rates are used separately as dependent variables. Although not shown in Table II, when the squared term of work hours was treated as the explanatory variable, we did not obtain any significant coefficients. Given these findings, we can conclude that work hours may be one of the factors that damage employees' mental health, although its impact is small.⁶

Table II also shows the estimated coefficients of firms' mental health measures and HRM practices. Although the expected signs for the four mental health measures are all negative, none of the negative coefficients are significant. For training and knowledge transfer to managers, the coefficients are positive and significant. From these results at least, we may conclude that popular mental health measures adopted among firms do not necessarily contribute to improving employees' mental health.

⁵ Since some information on past work hours was not included in several survey years, the number of observations for work hours is smaller than that for other variables.

⁶ It is worth noting, however, that the work hours data used in the estimation are reported from the employer's side. Therefore, there is a possibility that the figures may not include unpaid overtime hours. In addition, most Japanese firms do not record the length of work hours for those who are exempt from work hour regulations. If we consider actual hours worked, the results may be more striking. For an analysis of the effects of actual work hours on mental health based on data collected from the employees' side, see Kuroda and Yamamoto (2015).

On the other hand, we obtained significant and negative coefficients for the HRM practices of establishing a promotion office for employees' work-life balance and introduction of performance-based pay system. For example, estimation results indicate that where a firm establishes a promotion office to encourage employee's work-life balance, the total sick-leave and turnover ratio drops by 0.26 percent. We conclude that establishing such a section shows the employers' concern for workplace environment improvement. The estimation results may imply that the employer's efforts would benefit not only the work-life balance but also the mental health of employees.

As for the pay system, only about 40 percent of Japanese firms follow a performance-based system, with many firms having a seniority-based pay practice. However, the estimation results show that employees evaluated according to performance, and not seniority, tend to exhibit better mental health.

V. The effect of employee's mental health on firm performance

1. Graphical Analysis

In this section, we investigate the relationship between employees' mental health and firm performance based on Figures VI (1)(2) and the estimation results. Figure VI attempts to portray the relationship in several ways. First, in Figure VI(1), we plot the profit rate (ROS) across a range of total sick-leave and turnover rates of employees with mental disorder, roughly confirming negative correlation. That is, the ROS tends to decrease as the total sick-leave and turnover rate increases from 0 to more than 2 percent. The relationship is clearer in Figure VI(2), where we plot the change in ROS across a range of rates; those firms with higher rates tend to have a lower ROS.

Furthermore, Figure VI(3) presents three time period patterns to show how employees' mental health may affect ROS over time. In the figures, we first group the sample of firms into two: (i) firms where the total sick-leave and quit rate for mental disorders increased in a certain period (thick line) and (ii) firms whose ratio did not

increase during the period (thin line). The former group represents the decline in the average worker's mental health during the time. We then examine whether the average changes in ROS over the two-year period is significantly different between the two groups.

In Case 1 (sample grouped by period from 2004 to 2007), the average ROS as of 2006 was higher for firms with declining mental health than firms showing stable or improving mental health. In 2007, however, the ROS dropped more for firms with declining mental health than for other firms. This casual observation may suggest that employees' bad mental health may negatively affect firm performance.

In Case 2, we group firms into those whose total sick-leave and turnover rate increased from 2007 to 2009 and those whose ratios did not. While we do not observe a negative effect in 2009, we find one in 2010. This observation may imply that employees' mental health affects firm performance in the following year, gradually, and not immediately. However, we find a lagged but positive correlation between the ratio and ROS in Case 3, which focuses on firms with increasing absence and resignation ratios from 2009 to 2011.

These observations suggest that the charts may not reveal a clear relationship between employees' mental health and firm performance since many factors such as firm heterogeneity are not controlled for. Accordingly, we further investigate the relationship in the next subsection, using fixed effect estimation.

2. Regression Analysis: Basic and Instrument variable estimations

Table III(1) shows the estimation results of equation (2), where we use the total sick-leave and quit ratios of employees with mental disorder as explanatory variables. Note that the Hausman test supported a fixed effect model over a random effect model in each estimation. In addition, we employ one- and two-year lagged variables for employees' mental health, instead of using ratios without any lags, to consider the possibility that the effect on firm performance emerges with a certain lag.

From column (1) of Table III, we note that the total sick leave and turnover rate of employees with mental disorder has a negative coefficient at the 5 percent significance level, indicating that employees' mental disorders affect firm performance. According to the estimated coefficient, a 1 percent increase in the total ratio would result in a 0.2 percent decline in the profit rate. Using the sick-leave and quit rates separately, as listed in columns (4) and (7), also provides significantly negative coefficients. These results indicate that an increase in the number of employees with mental disorders would harm firm profits. On the other hand, the lagged variables of mental health in columns (2), (3), (5), (6), (8), and (9) are not statistically significant, which suggests that workers' mental health affects the firm's profit rate without much delay, rather than with a certain time lag.

The negative relationship with no time lag, as shown in columns (1), (4), and (7), may have been caused by the endogeneity problem. More specifically, there is a possibility of reverse causality; that is, the increase in firm profit improves employees' mental health, for example, through an increase in their wages. Although the possibility of reverse causality via time-invariant factors is excluded by controlling for individual firm fixed effects, we may still need to consider reverse causality via time-variant factors.

To account for this issue, we conducted a Durbin-Wu-Hausman test of endogeneity, which checks for possible endogeneity in the sick-leave and turnover rates of employees with mental disorders. The results of the endogeneity test are listed in the bottom row of Table III(1); we can confirm that the null hypothesis cannot be rejected in either case, indicating no presence of endogeneity. Thus, according to the test, the results in Table III(1) can be considered as credible estimates.

For greater stringency, we also estimated equation (2) using a fixed effect instrument variable as shown in Table III(2). As for the instrument variables, defined as z_{it} in equation (1), we employed employees' average work hours, mental health measures, policies, and HRM. We also conducted the Sargan-Hansen test of overidentifying restrictions to check for instrument variable validity.

Table III(2) shows that the coefficients of the total sick-leave and turnover rate and the sick-leave rate by itself are significant and negative, even where endogeneity is considered, but the coefficient of the turnover rate is not significant. The results of the overidentification test, shown in the second row from the bottom in Table III(2), cannot reject the null hypothesis, implying that the instrument variables are valid. Thus, even if we assume the presence of endogeneity, instrument variable estimation confirms that employees' mental health exerts significant and negative effects on firm performance. Putting these results together, we conclude that workers' mental disorders have a causal effect on firms' profits.

3. Regression Analysis Based on Fixed Employment Costs

To further investigate how employees' mental health could affect firm performance, we check for the possibility that firms with high fixed employment costs have a greater mental health effect on performance. This consists in checking whether the harm caused by absenteeism and presenteeism is greater for firms with high fixed employment costs. Furthermore, if a worker quits because of mental illness, investments on the employee turn into sunk costs, which we assume are greater for firms with large investments costs for hiring and training.

As for firms' fixed employment costs, we use four proxy variables. The first is the firm's ratio of relative employment volatility to output over the past decade, expected to vary by the extent of labor hoarding during recessions. Specifically, we split our sample into firms with above or below median employment volatility relative to output. The second variable is firm's turnover rate (the total number of newly hired employees and job leavers divided by the total number of employees). We assume that firms with lower turnover rates should have incurred higher fixed employment costs. As the third and fourth variables, we use two HRM-related bits of information. The original survey directly asks firms about the degree of importance they placed on long-term employment practices as well as employees' skill development. We assume that firms answering "very important" to these questions should have higher employment costs,

compared with firms providing other answers (“important,” “neutral,” “not very important,” and “not at all important”).

Dividing the sample into two groups by these methods, Table IV summarizes the coefficients of employees’ mental health variables, obtained by estimating equation (2). The first row of Table IV indicates that only firms with low employment volatility have significantly negative coefficients for mental health variables, suggesting that the negative effect of workers’ mental disorders on ROS is greater for firms with high fixed employment costs. The second, third, and last rows of Table IV indicate similar results. That is, the impact of employees’ mental health on firm performance is particularly strong for firms that incur high costs on employees and adopt long-term employment practices.

VI. Conclusion

Using the sick-leave and turnover rate of employees with mental disorders as a proxy for the average mental health of workers, we found the following results. First, long work hours have a small but significant effect on employees’ mental health. Second, the sick-leave and turnover rates of employees with mental disorders have significant and negative effects on firm performance, measured by ROS, even where unobservable individual firm heterogeneity and other factors are controlled for. That is, firms with higher sick-leave⁷ or turnover rates of employees with mental disorders tend to have lower annual profit rates. This result was confirmed even after the possibility of reverse causality (i.e., better firm performance could improve employees’ mental health) was considered. Third, the negative effect of workers’ bad mental health on the firm’s profit rate is greater for firms with high fixed employment costs, from an analysis based on

⁷ One may think that the annual profit rate in firms with higher sick-leave rates becomes lower simply because such firms need to incur personal costs of workers who are taking sick-leaves even though they do not engage in production. This does not apply however, since in Japan, sickness allowance from national health insurance are provided for workers who are unable to work for more than four days. Generally, firms do not pay wages to workers during sickness allowance is provided.

four different types of proxy variables reflecting firms' costs and long-term employment stance. Our findings suggest it is particularly important that firms incurring high human investment and recruiting costs pay attention to their employees' mental health, so that such expenditures do not turn into sunk costs, possibly resulting in loss of profit.

There is a persistent belief that individuals are to blame for their own mental health problems. Therefore, firms typically dismiss workers once they find that their mental health deterioration affects their productivity. For example, the OECD (2012) refers to a Swiss study showing that most employers consider a mental health-related problem to be "solved" when the worker in question has been dismissed. However, our findings suggest that the small percentage of employees with mental disorders, according to the sick-leave or turnover rates, is only the tip of the iceberg, and the ratio should be considered as a proxy variable for the mental health of all employees of a firm. Given these facts, trying to get rid of workers with evident mental health problems may not solve the problem. Improving employees' mental health is beneficial not only from the viewpoint of employee welfare but also from a business perspective.

References

- Bergström, Gunnar, Lennart Bodin, Jan Hagberg, Tomas Lindh, Gunnar Aronsson, and Malin Josephson, “Does Sickness Presenteeism have an Impact on Future General Health?,” *International Archives of Occupational Environmental Health*, 82 (2009), 1179–1190.
- Bharadwaj, Prashant, Mallesh M. Pai, and Agne Suziedelyte, “Mental Health Stigma,” NBER Working Paper No. 21240, 2015.
- Eriksson, Tor, “Healthy Personnel Policies,” *International Journal of Manpower*, 33(3), (2012), 233–245.
- Green, Francis, Alan Felstead, Duncan Gallie, and Hande Inanc, “Job-Related Well-Being Through the Great Recession,” *Journal of Happiness Studies*, (2014), doi:10.1007/s10902-014-9600-x.
- Gustavsson, Anders, Mikael Svensson, Frank Jacobi, Christer Allgulander, Jordi Alonso, Ettore Beghi, Richard Dodel, et al., “Cost of Disorders of the Brain in Europe 2010,” *European Neuropsychopharmacology*, 21(10), (2011), 718–779.
- Kaneko, Yoshihiro and Itaru Sato, *Jisatsu Utsubyo Taisaku no Keizaiteki Beneki (Jisatsu Usu niyoru Shakaiteki Sonshitsu) no Suikei (A Calculation of Economic Benefits from Introducing Measures to Cope with Suicide and Depression)* National Institute of Population and Social Security Research (2010) (in Japanese)
- Kuroda, Sachiko, and Isamu Yamamoto, “Workers’ Mental Health, Long Work Hours, and Workplace Management: Evidence from Workers’ Longitudinal Data in Japan,” RIETI Discussion Paper Series 16-E-017, Research Institute of Economy, Trade and Industry, 2016.
- Morikawa, Masayuki, “Economies of Density and Productivity in Service Industries: An Analysis of Personal Service Industries Based on Establishment-Level Data,” *Review of Economics and Statistics*, 93, No. 1 (2011), 179–192.

- OECD, Usual Working Hours per Week by Gender, OECD Family Database, OECD Social Policy Division, Directorate of Employment, Labour, and Social Affairs, OECD (2010).
- , *Sick on the Job? Myths and Realities about Mental Health and Work* (OECD Publishing, 2012).
- Sacker, Amanda, and Richard G. Wiggins, R., "Age-Period-Cohort Effects on Inequalities in Psychological Distress, 1981–2000," *Psychological Medicine*, 32(6), (2002), 977–90.
- Salanova, Marisa, Sonia Agut, and Jose Maria Peiro, "Linking Organizational Resources and Work Engagement to Employee Performance and Customer Loyalty: The Mediation of Service Climate," *Journal of Applied Psychology*, 90(6), (2005), 1217–1227.
- Schaufeli, Wilmar, Marisa Salanova, Vincente Gonzalez-Roma, and Arnold Bakker, "The Measurement of Engagement and Burnout: a Two Sample Confirmatory Factor Analytic Approach," *Journal of Happiness Studies*, 3(1), (2002), 71–92.
- Stewart, Walter, Judith Ricci, Elsbeth Chee, Steven Hahn, and David Morganstein, "Cost of Lost Productive Work Time among US Workers with Depression," *Journal of American Medical Association*, 289(23), (2003), 3135–3144.
- Verhaak Peter F.M., Nancy Hoeymans, Anna A. Garssen, and Gert P. Westert Verhaak, "Mental Health in the Dutch Population and in General Practice: 1987-2001", *British Journal of General Practice*, 55(519), (2005), 770–775.
- Xanthopoulou, Despoina, Arnold Bakker, Evangelia Demerouti, and Wilmar Schaufeli, "Work Engagement and Financial Returns: A Diary Study on the Role of Job and Personal Resources," *Journal of Occupational and Organizational Psychology*, 82(1), (2009), 183–200.

Table I Descriptive Statistics

	All period	Year						
		2004	2007	2009	2011	2012	2013	2014
Mental health variables								
Total ratio of sick-leave and turnover due to mental disorder (%)	0.321 (0.755)	0.106 (0.375)	0.149 (0.488)	0.232 (0.594)	0.248 (0.599)	0.562 (0.841)	0.535 (0.982)	0.571 (1.127)
Sick-leave rate due to mental disorder (%)	0.206 (0.493)	0.063 (0.244)	0.092 (0.282)	0.148 (0.373)	0.162 (0.399)	0.391 (0.587)	0.335 (0.650)	0.366 (0.726)
Turnover rate due to mental disorder (%)	0.115 (0.393)	0.043 (0.197)	0.057 (0.260)	0.084 (0.300)	0.087 (0.305)	0.170 (0.445)	0.200 (0.541)	0.205 (0.586)
Average weekly work hours	43.228 (5.055)	43.441 (5.255)	42.987 (4.961)	42.958 (4.957)	42.740 (4.659)	42.926 (4.562)	43.406 (5.123)	44.186 (5.612)
Mental health measure dummies (1 if introduced until previous year)								
Mental health training and knowledge transfer to managers	0.265 (0.441)	0.188 (0.391)	0.196 (0.397)	0.217 (0.412)	0.255 (0.436)	0.436 (0.496)	0.339 (0.474)	0.295 (0.456)
Employer-employee health committee to discuss workplace mental	0.206 (0.405)	0.140 (0.347)	0.154 (0.361)	0.169 (0.375)	0.199 (0.399)	0.332 (0.471)	0.267 (0.443)	0.236 (0.425)
Employees' stress surveys	0.138 (0.345)	0.093 (0.291)	0.101 (0.302)	0.116 (0.321)	0.135 (0.342)	0.184 (0.388)	0.180 (0.384)	0.175 (0.380)
Work environment assessment	0.162 (0.368)	0.127 (0.333)	0.133 (0.340)	0.140 (0.347)	0.145 (0.352)	0.256 (0.437)	0.205 (0.404)	0.173 (0.379)
Human resource management dummies (1 if introduced until previous year)								
Flextime system	0.147 (0.354)	0.126 (0.332)	0.129 (0.335)	0.144 (0.351)	0.146 (0.353)	0.184 (0.388)	0.169 (0.374)	0.139 (0.346)
Establishment of a dedicated section for employees' WLB	0.091 (0.288)	0.079 (0.269)	0.070 (0.256)	0.073 (0.260)	0.089 (0.285)	0.175 (0.381)	0.105 (0.307)	0.089 (0.285)
Organizational efforts to reduce overtime	0.347 (0.476)	0.285 (0.452)	0.293 (0.455)	0.309 (0.462)	0.338 (0.473)	0.489 (0.500)	0.402 (0.490)	0.379 (0.485)
Introduction of performance-based pay system	0.379 (0.485)	0.333 (0.472)	0.360 (0.480)	0.378 (0.485)	0.368 (0.483)	0.422 (0.494)	0.423 (0.494)	0.381 (0.486)
ROS (%)	2.730 (4.402)	2.663 (3.845)	3.141 (4.117)	1.818 (4.409)	2.668 (4.535)	3.308 (4.498)	2.739 (4.411)	3.442 (4.700)
Number of employees	209.279 (545.370)	178.034 (217.953)	185.764 (278.340)	224.630 (815.327)	196.962 (608.954)	431.166 (789.629)	191.523 (425.209)	165.274 (280.011)
Observations	8,128	943	1,096	1,282	1,985	548	1,466	808

Note: Numbers in parentheses represent the standard deviation.

Table II Estimation Results: Mental Health

	Sick-leave and turnover		Sick-leave		Turnover	
	(1)	(2)	(3)	(4)	(5)	(6)
Average weekly work hours	0.0061+	0.0061+	0.0032	0.0033	0.0019	0.0019
	(0.0033)	(0.0033)	(0.0020)	(0.0020)	(0.0020)	(0.0020)
Mental health measure dummies (1 if introduced until previous year)						
Mental health training and knowledge transfer to managers		0.1605+		0.1219*		0.0548
		(0.0871)		(0.0494)		(0.0486)
Employer-employee health committee to discuss workplace mental		0.0087		0.0013		-0.0225
		(0.0907)		(0.0541)		(0.0528)
Employees' stress surveys		0.0017		0.0344		-0.0486
		(0.0978)		(0.0626)		(0.0442)
Work environment assessment		0.0513		0.0095		0.0395
		(0.1060)		(0.0578)		(0.0573)
HRM practice dummies (1 if introduced until previous year)						
Flextime system		0.0853		0.0599	0.0036	0.0036
		(0.1936)		(0.1157)	(0.0834)	(0.0826)
Establishment of a dedicated section for employees' WLB		-0.2596*		-0.0960	-0.1309**	-0.1420**
		(0.1029)		(0.0652)	(0.0481)	(0.0489)
Organizational efforts to reduce overtime		0.0029		-0.0056	0.0207	0.0136
		(0.0641)		(0.0344)	(0.0402)	(0.0385)
Introduction of performance-based pay system		-0.1300*		-0.0744*	-0.0568	-0.0656+
		(0.0613)		(0.0353)	(0.0365)	(0.0365)
Number of employees	0.0001*	0.0001*	0.0000*	0.0000**	0.0000	0.0000
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Year dummies (base=2004)						
2007	0.0505**	0.0508**	0.0348**	0.0348**	0.0154+	0.0156+
	(0.0175)	(0.0177)	(0.0099)	(0.0100)	(0.0088)	(0.0088)
2009	0.0981**	0.0969**	0.0723**	0.0704**	0.0271**	0.0269**
	(0.0184)	(0.0188)	(0.0119)	(0.0122)	(0.0096)	(0.0096)
2011	0.1337**	0.1260**	0.1028**	0.0936**	0.0392**	0.0376**
	(0.0207)	(0.0220)	(0.0137)	(0.0145)	(0.0118)	(0.0120)
2012	0.3776**	0.3712**	0.2714**	0.2612**	0.0919**	0.0904**
	(0.0489)	(0.0492)	(0.0311)	(0.0317)	(0.0257)	(0.0258)
2013	0.3977**	0.3829**	0.2618**	0.2469**	0.1432**	0.1398**
	(0.0310)	(0.0325)	(0.0198)	(0.0206)	(0.0178)	(0.0182)
2014	0.4396**	0.4333**	0.3368**	0.3303**	0.1425**	0.1410**
	(0.0647)	(0.0651)	(0.0418)	(0.0421)	(0.0375)	(0.0376)
Constant	-0.1530	-0.1416	-0.0790	-0.0826	-0.0064	-0.0087
	(0.1462)	(0.1523)	(0.0899)	(0.0936)	(0.0913)	(0.0918)
Observations	6,286	6,286	6,962	6,962	6,286	6,286
Number of firms	2,236	2,236	2,300	2,300	2,236	2,236

Notes: 1. Numbers in parentheses are robust standard errors.

2. **, *, and + indicate statistical significance at the 1%, 5%, and 10% levels.

Table III Estimation Results: Returns on Sales

(1) Fixed effect estimation results

	Sick-leave and turnover			Sick-leave			Turnover		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Sick-leave and/or turnover due to mental disorder	-0.2182** (0.0822)			-0.1905+ (0.1063)			-0.3525* (0.1557)		
1 year lag		-0.0617 (0.1159)			-0.1441 (0.1674)			0.0251 (0.2420)	
2 year lag			-0.0878 (0.1611)			-0.0095 (0.2319)			-0.3536 (0.3379)
Number of employees	-0.0000 (0.0001)	1.0209** (0.3143)	0.3153* (0.1264)	-0.0000 (0.0001)	1.0472** (0.2811)	0.3883** (0.1264)	-0.0000 (0.0001)	1.0216** (0.3141)	0.3184* (0.1256)
Year dummies (base=2004)									
2007	0.4175** (0.1287)	-0.2473+ (0.1331)	-1.2897** (0.1481)	0.4669** (0.1186)	-0.2187+ (0.1176)	-1.2941** (0.1373)	0.4114** (0.1288)	-0.2505+ (0.1331)	-1.2896** (0.1480)
2009	-0.8870** (0.1506)	-1.7206** (0.1691)	-0.5920** (0.1453)	-0.8782** (0.1433)	-1.7282** (0.1614)	-0.6555** (0.1385)	-0.9001** (0.1509)	-1.7277** (0.1688)	-0.5918** (0.1449)
2011	-0.2298 (0.1435)	-0.3941** (0.1453)	-0.3969** (0.1530)	-0.2611+ (0.1332)	-0.4466** (0.1308)	-0.5066** (0.1379)	-0.2485+ (0.1433)	-0.4044** (0.1441)	-0.3969** (0.1517)
2012	0.4096* (0.1873)	-0.2609 (0.2516)	-0.3581 (0.4374)	0.2337 (0.1595)	-0.3741+ (0.1963)	-0.6115 (0.4382)	0.3588+ (0.1870)	-0.2880 (0.2500)	-0.3557 (0.4373)
2013	0.1245 (0.1549)	-0.3407 (0.2378)		0.0313 (0.1477)	-0.3723 (0.2277)		0.0855 (0.1539)	-0.3659 (0.2368)	
2014	0.5040* (0.1967)			0.4743* (0.1851)			0.4560* (0.1962)		
Constant	2.8414** (0.1117)	-7.3677* (3.2372)	-0.0773 (1.2974)	2.8570** (0.1007)	-7.6082** (2.8950)	-0.7789 (1.2972)	2.8363** (0.1115)	-7.3822* (3.2359)	-0.1018 (1.2901)
Observations	8,128	5,978	5,243	8,975	6,755	6,016	8,128	5,978	5,243
Number of firms	2,571	2,307	2,071	2,603	2,414	2,329	2,571	2,307	2,071
Test for endogeneity (Durbin-Wu-Hausman)	6.12 (0.5253)			8.5 (0.2908)			3.11 (0.8744)		

- Notes: 1. The dependent variable is ROS (return on sales).
2. Numbers in parentheses are robust standard errors.
3. **, *, and + indicate statistical significance at the 1%, 5%, and 10% levels.

(2) Fixed instrument variable estimation results

	Sick-leave and turnover	Sick-leave	Turnover
	(1)	(2)	(3)
Sick-leave and/or turnover due to mental disorder	-2.9825* (1.2794)	-4.4573* (1.8015)	-3.1728 (2.9991)
Number of employees	0.0002 (0.0002)	0.0002 (0.0002)	0.0000 (0.0002)
Year dummies (base=2004)			
2007	0.5563** (0.1927)	0.5419** (0.1782)	0.4584** (0.1755)
2009	-0.6270** (0.2095)	-0.6022** (0.2062)	-0.8251** (0.1772)
2011	0.1834 (0.2455)	0.2241 (0.2464)	-0.0876 (0.1997)
2012	1.5019** (0.5468)	1.3808* (0.5381)	0.6670+ (0.3623)
2013	1.2369* (0.5342)	1.1358* (0.4974)	0.4973 (0.4442)
2014	1.5318* (0.6286)	1.6356* (0.6657)	0.6671 (0.4958)
Constant	3.0847** (0.2072)	3.0962** (0.1759)	2.9115** (0.2096)
Observations	6,286	6,962	6,286
Number of firms	2,236	2,300	2,236
Overidentification test (p value)	4.905 (0.7677)	3.863 (0.8693)	9.797 (0.2796)

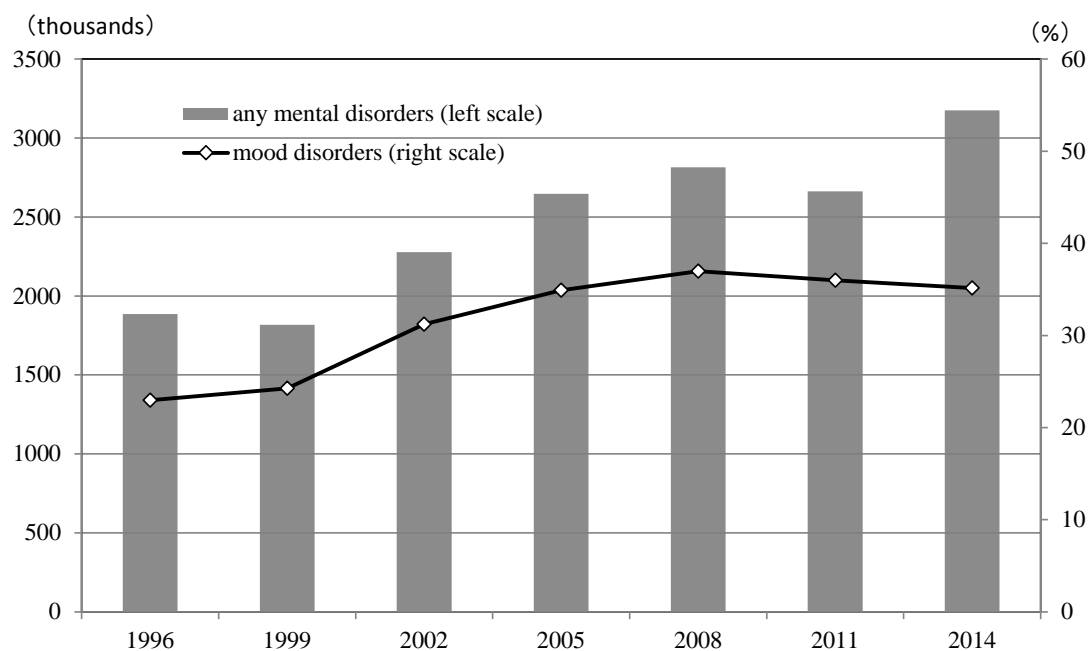
- Notes: 1. The dependent variable is ROS (return on sales).
2. Numbers in parentheses are robust standard errors.
3. **, *, and + indicate statistical significance at the 1%, 5%, and 10% levels.
4. Instrument variables are mental health measures (Training to the managers, deliberation by health committee, survey for employee's stress, assessment of work environment), human resource management measures (Flexitime system, establishment of department for work-life balance practice, organizational efforts to reduce overtime, performance-based pay system), and average work hours.

Table IV Estimation Results: Coefficients of Firm Characteristics

	(1)	(2)	(3)
	Sick-leave and turnover	Sick-leave	Turnover
Relative employment volatility to output			
Less than median	-0.3011* (0.1394)	-0.1970 (0.1567)	-0.5961* (0.2651)
More than median	-0.1870 (0.1159)	-0.1838 (0.1425)	-0.1675 (0.2102)
Turnover rate in total employment			
Less than median	-0.3102* (0.1369)	-0.3806* (0.1788)	-0.3737 (0.2961)
More than median	-0.1504 (0.1090)	-0.0436 (0.1423)	-0.3036 (0.1914)
HR policy for the long-term employment practice			
Very important	-0.3305** (0.0962)	-0.3893** (0.1308)	-0.4461* (0.1770)
Others	0.0352 (0.1285)	0.1523 (0.1803)	-0.0111 (0.2649)
HR policy for the training on employee's skill development			
Very important	-0.2784* (0.1215)	-0.2736+ (0.1485)	-0.4081+ (0.2299)
Others	-0.1499 (0.1133)	-0.0730 (0.1547)	-0.3194 (0.2220)

- Notes: 1. The dependent variable is ROS (return on sales).
2. Numbers in parentheses are robust standard errors.
3. **, *, and + indicate statistical significance at the 1%, 5%, and 10% levels.

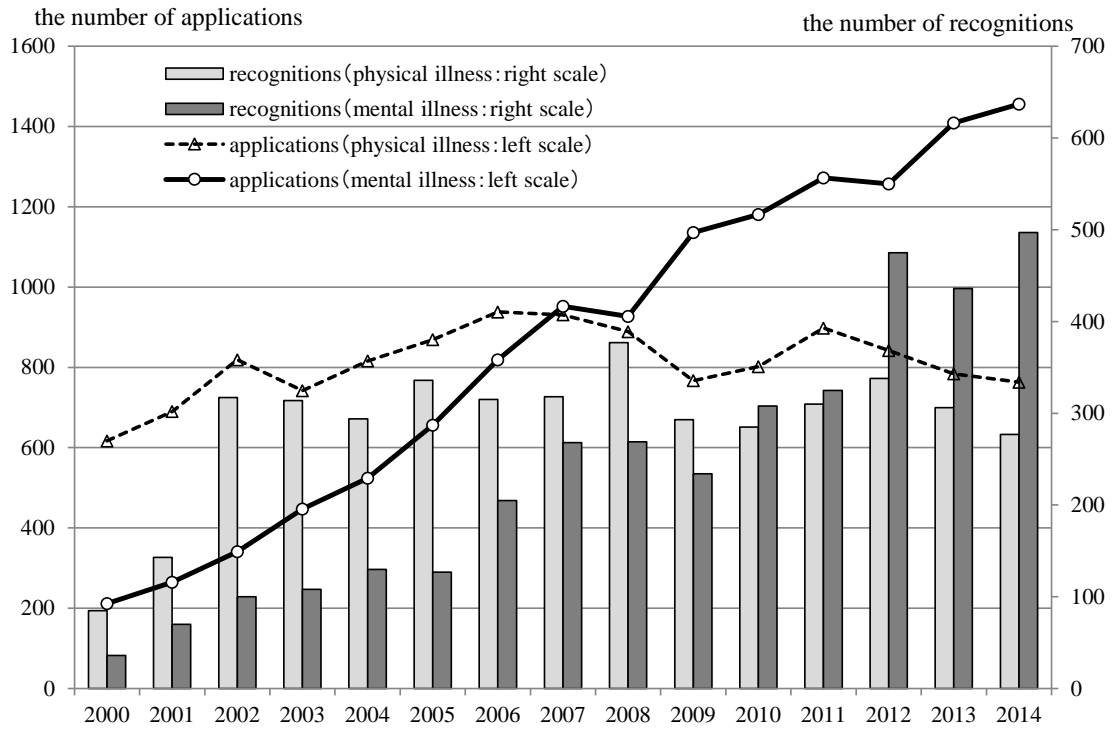
Figure I Number of People Consulting Doctors Because of Mental Illnesses



Source: *Patient Survey*, Ministry of Health, Labour, and Welfare, Japan

Note: For 2011, areas that suffered from the severe damage caused by the Great East Japan Earthquake are excluded from the data.

**Figure II Workers' Compensation Insurance
(Number of Applications and Approved Claims)**



Source: Ministry of Health, Labour, and Welfare, Japan

Figure III Relationship between Mental Health and Work Hours

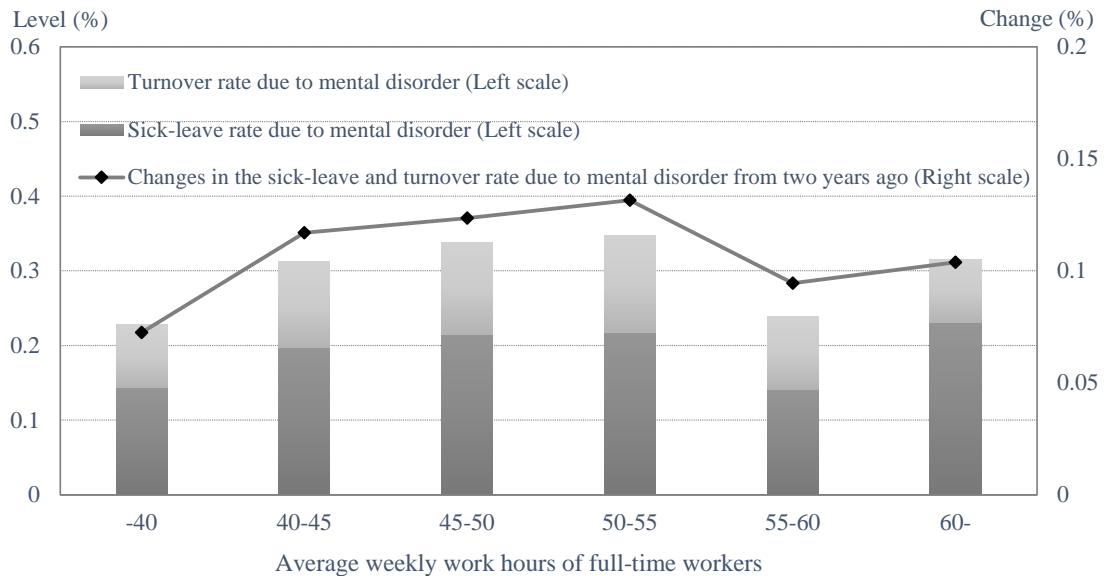


Figure IV Relationship between Mental Health and Firm's Measures

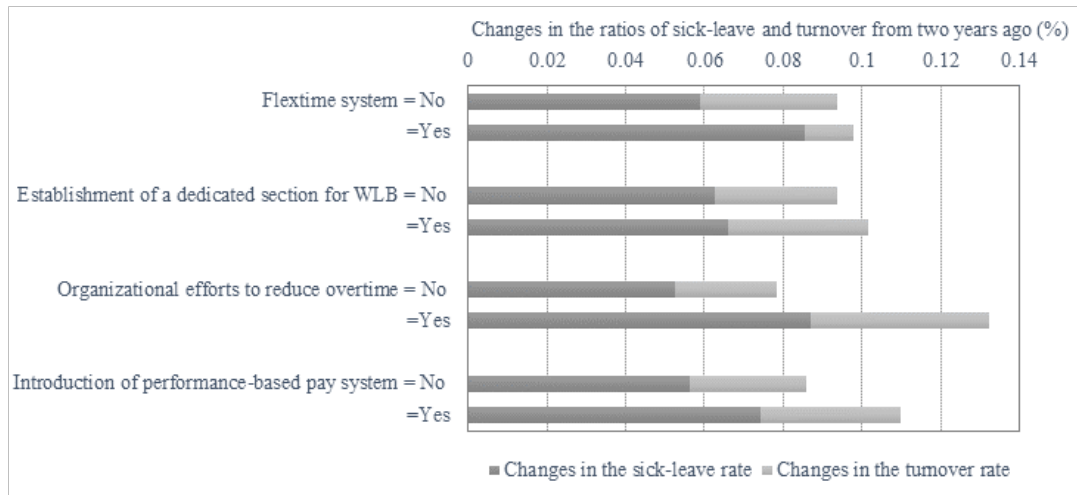


Figure V Relationship between Mental Health and HR Practices

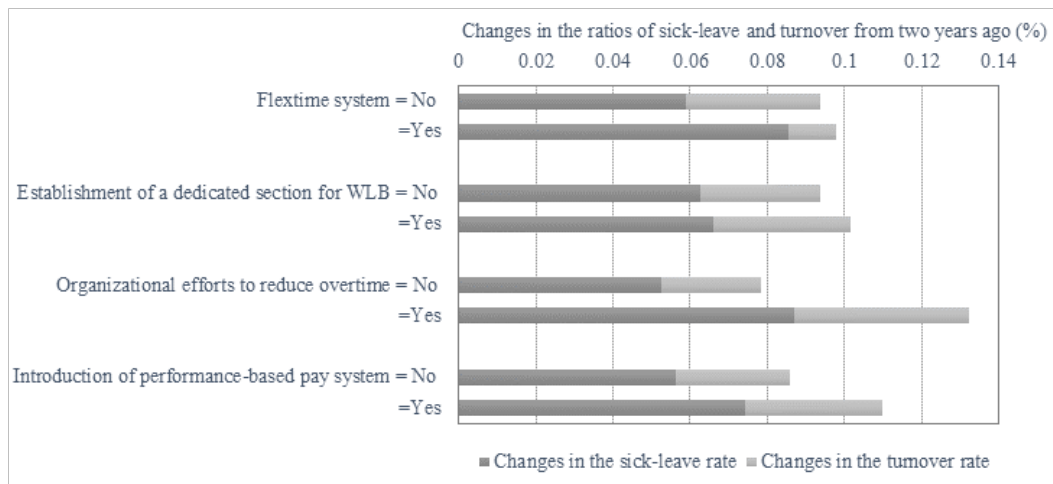
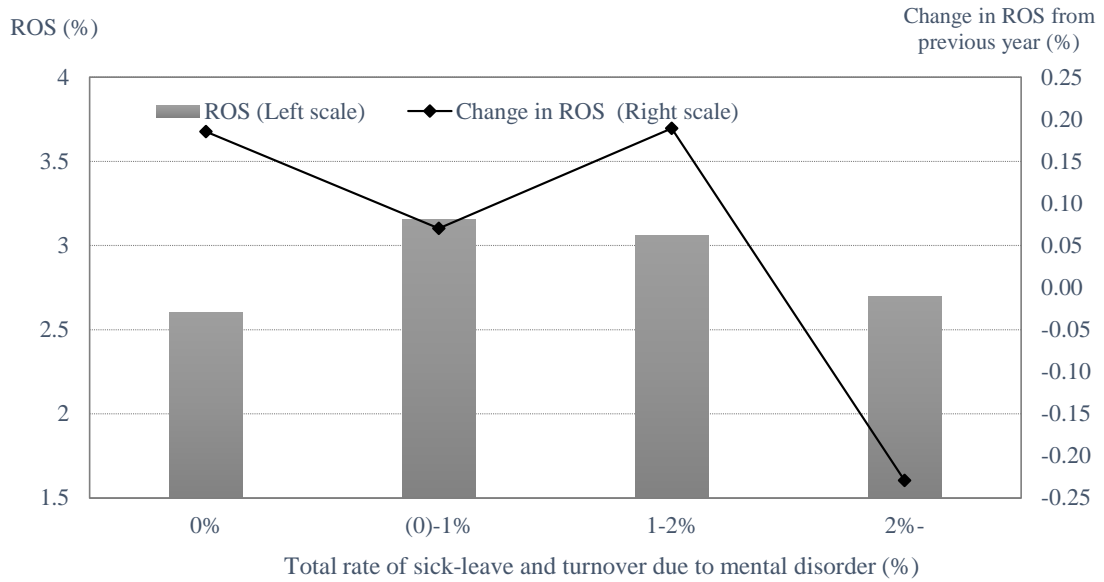
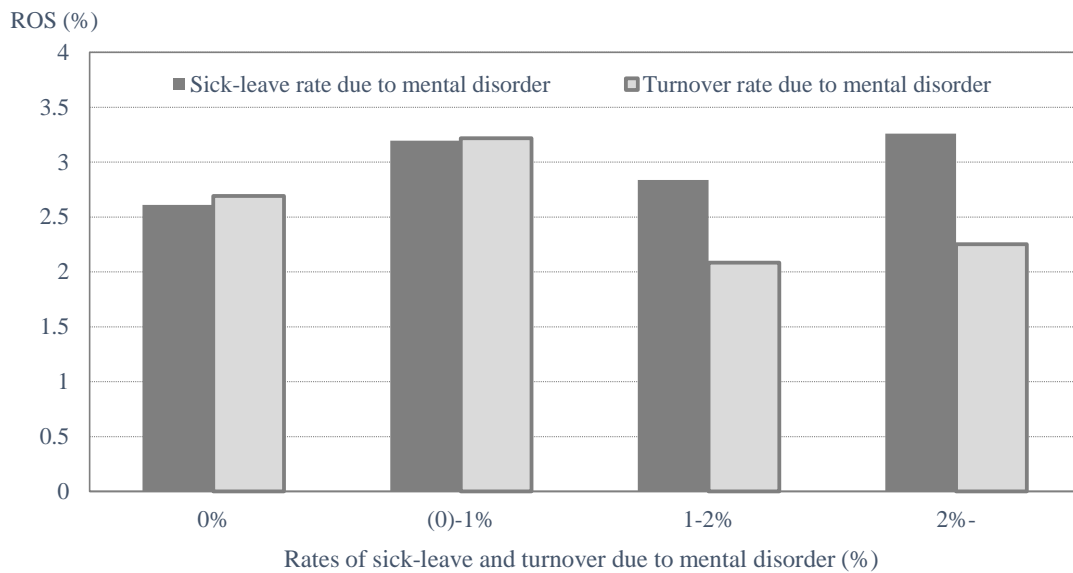


Figure VI Relationship between Mental Health and Firm Performance

(1) ROS and the sick-leave and turnover rate due to mental disorder

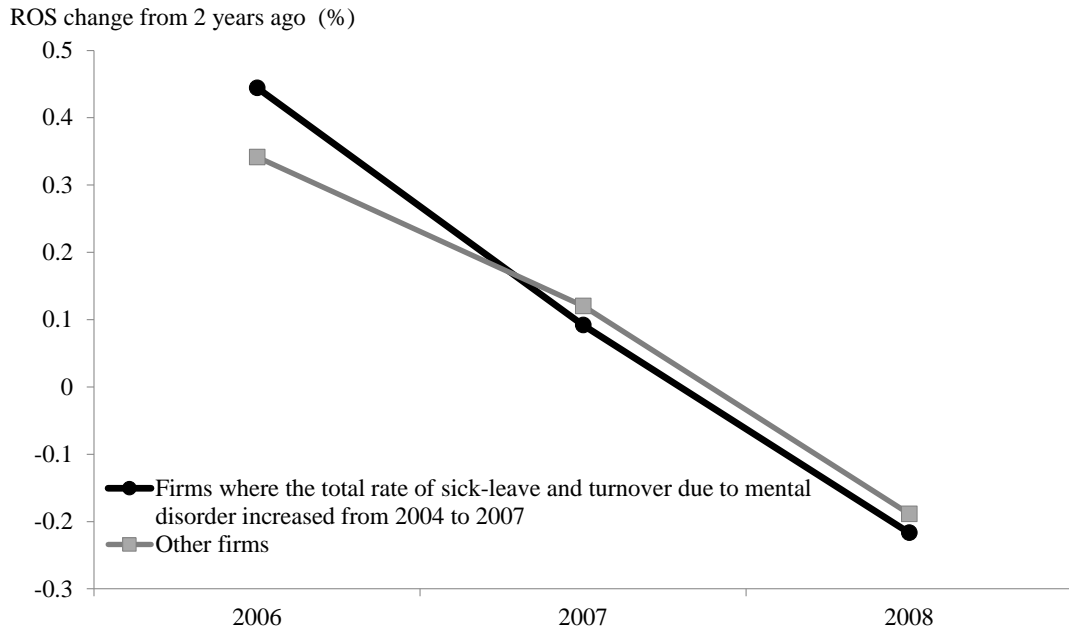


(2) ROS change and sick-leave and turnover rate due to mental disorder

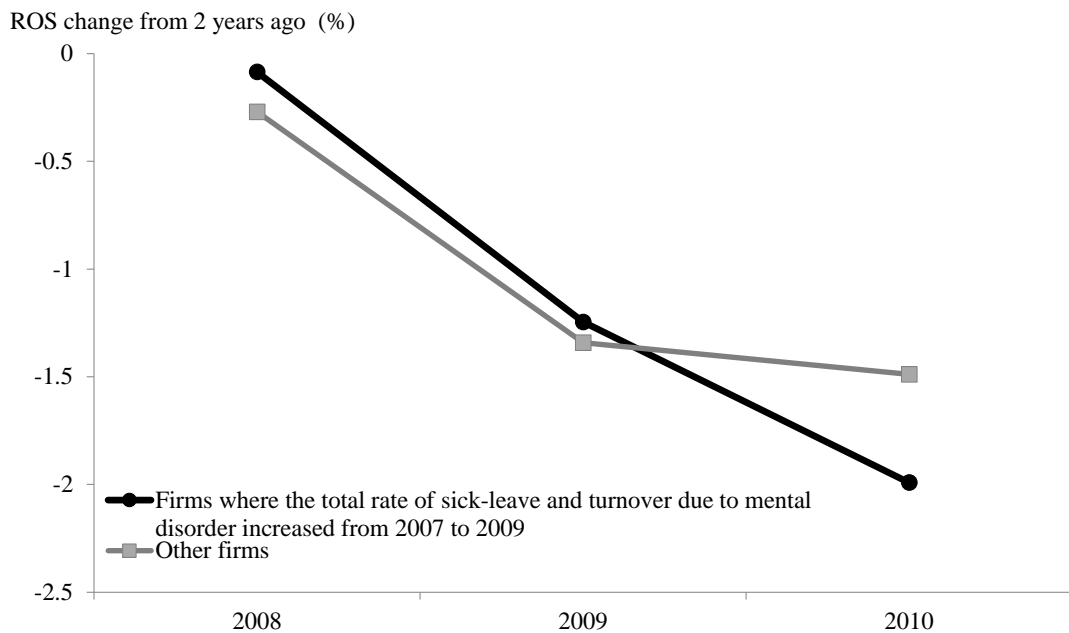


(3) Time series variation of ROS change depending on mental health

Case 1: Difference in mental health in 2007



Case 2: Difference in mental health in 2009



Case 3: Difference in mental health in 2011

