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PDF issue: 2026-11-24

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(Citation)
神戸大学経済学研究科 Discussion Paper,1424

(Issue Date)
2014

(Resource Type)
technical report

(Version)
Version of Record

(URL)
https://hdl.handle.net/20.500.14094/81008529

Job-related stress in academia: the role of relative deprivation, hours worked for different tasks, and children

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September 2014
Discussion Paper No.1424

GRADUATE SCHOOL OF ECONOMICS

KOBE UNIVERSITY

ROKKO, KOBE, JAPAN

Job-related stress in academia: the role of relative deprivation, hours worked for different tasks, and children

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We examine the role of income relative deprivation, hours worked for different tasks, and children in the job-related stress experienced by academics. Males' job-related stress increases when their incomes are lower than that of their peers', but females are not susceptible to such income comparisons. Job-related stress decreases with hours spent on research provided the hours are not excessive, but hours spent in teaching and on administrative tasks always increase job-related stress. The presence of young children increases job-related stress only for females, and children largely explain the observed gender differences in job-related stress.

JEL Classification: J28, J81
Keywords: job-related stress, relative deprivation

I. Introduction

Job-related stress is considered as one of the leading work-related health problems, constituting a major area of research in the fields of medicine, psychology, and higher education. However, relevant literature in economics is limited. This paper examines the determinants of job-related stress in an economics context for an occupation of direct interest to us, namely academia. Specifically, we investigate the extent to which income relative deprivation, hours worked for different tasks, and the presence of children affect job related stress, using a unique data set obtained from Japanese academics in science and engineering related departments.

The relative deprivation hypothesis states that individuals' well-being is adversely affected when they perceive that their incomes are lower than those of their reference groups (Duesenberry, 1949; Wilkinson, 1996, 1997). The impact of relative income on stress is scarcely explored by economists, although several studies investigate the relationship between relative income and health outcomes. For example, Eibner and Evans (2005) and Miller and Paxson (2006) find that having a level of income lower than that of one's peers is associated with an increased risk of mortality.[1] These studies assume that a low relative income negatively affects health because it increases the stress of an individual. However, they do not explore the direct link between low relative income and stress. We aim to investigate the extent to which relative income affects job-related stress.

Next, we investigate the effect of hours worked on job-related stress. While long hours are endemic in Japan, we rather focus on whether hours spent in research, teaching, and on administrative duties have different effects on job-related stress.[2] The Carnegie Surveys on Japanese academics show that about 73% of Japanese faculty prefer research to teaching

[1] See also Jones and Wildman (2008) and Balsa (2013) for further evidence.

[2] For a review of the patterns of working hours in Japan, see Hamermesh *et al.* (2014).

and administrative work (Arimoto, 2011). Psychology literature on intrinsic motivation indicates that workers derive satisfaction from performing tasks that they enjoy (Herzberg, 1966; Ryan and Deci, 2000).

Accordingly, if academics do enjoy their research activities, the time spent on research may not increase their stress levels as much as the other tasks, or it may even decrease stress. Moreover, teaching and administrative work would deprive academics of time for research, which in turn will increase frustration, another reason why teaching and administrative tasks might cause higher levels of stress compared with research. We contribute to the studies on job-related stress by showing that different tasks have different effects on stress, and the hours spent by workers on tasks they enjoy could potentially decrease stress.

Finally, we examine the effect of children on job-related stress. Manson *et al.* (2013) show that young children negatively affect the tenure attainment and research productivity of female academics. It is, therefore, likely that children increase job-related stress. This issue is especially important in relation to the gender gap that exists in the reported level of stress, since studies on stress generally indicate that female workers report higher levels of stress than male workers (Blix *et al.*, 1994; Leontaridi and Ward, 2002; Takahashi and Takahashi, 2010). Such a gender disparity in reported stress levels may be the result of child-rearing activities that are disproportionately allotted to females.[3] We aim to examine if the presence of children affects job-related stress, and if gender disparity in reported job-related stress is primarily caused by the presence of children.

II. Data and Variables

We obtained data through a survey administered via a postal questionnaire in 2011. First, we collected the names (29 114 names in total) of the full-time faculty of the sciences

[3]In the survey data utilized in this paper, we enquired the percentage of household work performed (including child rearing). The average percentage of household work performed is 20.6% and 71.6% for married males and females, respectively.

and engineering related departments in Japan from the web pages of all the four-year universities accredited by the Ministry of Education, Sports, and Science. Second, we chose all feminine names (1122 names) from the total collected names, and randomly selected 3678 names from the remaining names assumed masculine. We sent questionnaires to the department addresses, and received 1636 responses (a response rate of 34%). After eliminating observations with missing variables and restricting the sample to lecturers, assistant professors, associate professors, and full professors, our final sample contains 1537 observations.

We evaluated the level of job-related stress based on answers to the question: 'What is your degree of job-related stress?' Respondents replied using a six-point scale ranging from 'no stress' to 'very high stress'. Since some categories garnered few observations, we re-categorized and created a four-point scale *job-related stress* variable as follows: 1='low/very low/none', 2='average', 3='high', and 4='very high'. 8.58% of the sample fell into the 'low/very low/none' category, 37.61% in 'average', 37.03% in 'high', and 16.77% fell into the 'very high' category.

To investigate whether relative income affects job-related stress, we first estimate a conventional salary regression, and treat the predicted income as an individual's comparison income. This idea parallels that of Clark and Oswald (1996). Since an academic might not react to a small deviation from the comparison income, we create the potential relative deprivation measure, $I\{Residual_i < 10^{th} percentile\}$, which takes a value of 1 if the residual is below the 10th percentile. The salary regression contains the same variables used in the stress regressions.[4] Table 1 Column 1 presents the summary statistics.

[4]It contains the same variables in Table 1 Model 1, except the relative income measure.

III. Results and Conclusions

First, we present the results of the effects of relative income on job-related stress. We regressed *Job-related stress* on the potential relative income deprivation measure, $Residual_i < 10^{th} percentile$, and other characteristics using ordered probit models. Model 1 in Table 1 shows that even after controlling for the actual salary, those who face potential relative deprivation report higher levels of stress. Note that the actual salary does not have a statistically significant coefficient, indicating that relative income, rather than actual income, affects stress–results that accord well with the findings by Clark and Oswald (1996) in their analysis of job satisfaction.

Clark *et al.* (2013) suggest in their study of job satisfaction that females are not susceptible to relative income comparisons. Does such a result extend to the case of job-related stress? To answer this question, we added an interaction term between *Female* and the relative deprivation measure in Model 2. The interaction term is negative and statistically significant at the 1% level. Joint significance tests show that the relative deprivation measure is statistically significant only for males. The marginal effect implies that males facing potential relative deprivation are 12 percentage points more likely to report the highest level of stress.

Next, we investigate the effect of hours worked on reported stress levels. Model 3 simply adds weekly hours worked. The coefficient for hours worked is positive and statistically significant at the 1% level. We then examine if work hours spent in research, teaching, and on administrative tasks have different effects on job-related stress. Our questionnaire enquired for the percentage of work time allocated for each of these tasks.[5] Multiplying the weekly hours by these percentages, we computed hours per week spent on each task. The

[5]The questionnaire has an 'other task' category. We included this category in the administrative tasks category.

results are shown in Model 4. To capture the non-linear effects of hours worked, we also include squared terms (except for teaching hours, since its squared term did not improve the fit of the model). Due to incomplete or inconsistent answers received for the time allocation for different tasks, the number of observations reduced to 1482.[6]

All coefficients for different tasks are statistically significant. The presence of quadratic terms makes it difficult to assess the effect of hours worked for different tasks. Thus, we computed the predicted probabilities of reporting the highest level of stress by hours worked for each task and plotted them in Fig.1. Graphs are restricted to the ranges of hours worked that are within two standard deviations from the mean. For research hours, job-related stress decreases until research hours reach 30 hours per week, a point well beyond the sample mean. It subsequently increases, but the effects are very mild. These results are consistent with the possibility that hours spent on the tasks that workers enjoy performing could reduce stress provided the hours are not excessive. In contrast, hours spend in teaching and on administrative tasks always increase job-related stress. A 10-hour increase from the mean in hours worked would increase the probability of reporting the highest level of stress by 3 percentage points in the case of teaching hours, and 5 percentage points in the case of administrative hours.

Finally, we examine the effects of children on job-related stress. The previous models show no effect of the presence of children on job-related stress. This could be because the presence of children affects the job-related stress only for females, who typically bear greater child-rearing responsibility than males. Also note that female coefficients are positive and highly significant in all previous models. These patterns indicate that the female dummy might capture the effects of children on job-related stress. To test this possibility, we include interaction terms between *Female* and the number of children variables. Since Manson *et al.*

[6] Among 1537 observations, 20 of them did not report an allocation and 35 of them reported allocations that did not sum up to 100%.

(2013) show the possibility that marriage also negatively affects the labor market outcomes of female academics', we also include a female-marriage interaction.

Model 5 shows the results. Although the coefficient for *#Children aged 5 or below* is not statistically significant, the interaction between this variable and *Female* has a positive and significant coefficient, indicating that the presence of young children increases job-related stress only for females. The marginal effect shows that one extra child in this age bracket would increase the probability of reporting the highest level of stress for female academics by 7 percentage points. We did not find statistically significant effects for *#Children aged 6 to 18* and *Marriage* for either males or females. Interestingly, after the inclusion of these interaction terms, the female coefficient became small and statistically insignificant, indicating that the gender difference in job stress levels is primarily driven by the presence of young children.

In conclusion, the empirical results are consistent with our expectations. Income relative deprivation effects were found in terms of job-related stress, but such effects were seen only among male academics. Job-related stress decreases with hours spent on research provided the hours were not excessive, indicating the possibility that tasks which workers enjoy performing could reduce stress. However, hours spent in teaching and on administrative tasks always increase job-related stress. Young children increased stress only for female academics, and the observed gender gap in job-related stress is largely explained by the presence of young children.

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Table 1: Estimation Results: Ordered Logistic Regressions

Variables	Mean(SD)	Model 1	Model 2	Model 3	Model 4	Model 5
Residual$_i$<10^{th}percentile	0.100	0.437*	0.763***	0.745***	0.662**	0.744***
	(0.300)	(0.227)	(0.248)	(0.252)	(0.268)	(0.252)
(Residual$_i$<10^{th}percentile)			-1.244***	-1.164***	-1.019**	-1.120***
×(Female)			(0.394)	(0.396)	(0.415)	(0.399)
Weekly total hours worked/10	6.014			0.210***		0.221***
	(1.537)			(0.038)		(0.038)
Weekly research hours/10	2.204				-0.277**	
	(1.250)				(0.115)	
Weekly research hours^2/100					0.048***	
					(0.017)	
Weekly teaching hours/10	2.232				0.246***	
	(1.060)				(0.062)	
Weekly administrative hours/10	1.565				0.576***	
	(0.087)				(0.128)	
Weekly administrative hours^2/100					-0.041*	
					(0.023)	
Female	0.192	0.354***	0.496***	0.533***	0.449***	0.217
	(0.394)	(0.135)	(0.139)	(0.142)	(0.149)	(0.265)
#Children aged 5 and below	0.206	0.072	0.063	0.054	0.039	-0.021
	(0.510)	(0.110)	(0.111)	(0.109)	(0.111)	(0.117)
(#Children aged 5 and below)						0.570**
×(Female)						(0.247)
#Children aged 6 to 18	0.429	0.051	0.051	0.039	0.022	0.020
	(0.767)	(0.074)	(0.074)	(0.074)	(0.076)	(0.077)
(#Children aged 6 to 18)						0.184
×(Female)						(0.243)
Married	0.810	-0.045	-0.029	0.006	-0.071	-0.101
	(0.392)	(0.150)	(0.151)	(0.153)	(0.155)	(0.184)
(Married)×(Female)						0.237
						(0.316)
Log(annual salary)	6.684	0.186	0.193	0.218	0.243	0.237
(Mean salary=8.4 million yen)	(0.305)	(0.423)	(0.427)	(0.427)	(0.466)	(0.427)
Full professor	0.398	-0.564**	-0.566**	-0.574**	-0.761**	-0.571**
	(0.490)	(0.287)	(0.289)	(0.289)	(0.301)	(0.286)
Associate professor	0.300	-0.578**	-0.591**	-0.572**	-0.665***	-0.565**
	(0.458)	(0.233)	(0.232)	(0.232)	(0.240)	(0.228)
Assistant professor	0.0547	-0.206	-0.151	-0.149	-0.312	-0.140
	(0.227)	(0.286)	(0.286)	(0.287)	(0.300)	(0.285)
Academic experience (in years)	15.96	0.048	0.045	0.059*	0.057*	0.054*
	(11.31)	(0.031)	(0.031)	(0.032)	(0.032)	(0.032)
Academic experience^2		-0.002**	-0.002**	-0.002***	-0.002**	-0.002**
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Non academic experience (in years)	3.256	0.056***	0.057***	0.056***	0.047**	0.057***
	(6.857)	(0.020)	(0.020)	(0.021)	(0.021)	(0.021)
Non academic experience^2		-0.002**	-0.002**	-0.002**	-0.001*	-0.002**
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Private university	0.313	-0.233	-0.237	-0.180	-0.246	-0.194
	(0.464)	(0.149)	(0.151)	(0.152)	(0.165)	(0.154)
Department offers PhDs	0.898	0.119	0.141	0.061	0.131	0.064
	(0.303)	(0.188)	(0.189)	(0.194)	(0.205)	(0.193)

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Table 1 Continued

Have a PhD	0.925	-0.031	-0.027	0.005	0.085	0.002
	(0.264)	(0.187)	(0.186)	(0.187)	(0.188)	(0.189)
Fixed term contract	0.179	0.140	0.147	0.147	0.144	0.154
	(0.383)	(0.146)	(0.147)	(0.149)	(0.153)	(0.149)
Have a managerial position	0.107	0.309*	0.325**	0.341**	0.189	0.347**
	(0.309)	(0.161)	(0.162)	(0.162)	(0.171)	(0.162)
No teaching obligation	0.122	-0.474**	-0.470**	-0.452**	-0.362*	-0.465**
	(0.328)	(0.210)	(0.209)	(0.210)	(0.209)	(0.209)
#Subjects taught per year	3.772	0.030	0.028	0.018	0.009	0.018
	(2.601)	(0.028)	(0.028)	(0.029)	(0.029)	(0.029)
#Sessions taught per week	5.698	0.066***	0.066***	0.053***	0.049**	0.051***
	(3.310)	(0.019)	(0.019)	(0.020)	(0.020)	(0.020)
Teach graduate courses	0.720	-0.025	-0.029	0.005	-0.034	0.016
	(0.449)	(0.170)	(0.170)	(0.170)	(0.174)	(0.170)
Supervise MA or PhD students	0.768	0.218*	0.206	0.131	0.102	0.122
	(0.422)	(0.131)	(0.131)	(0.133)	(0.137)	(0.132)
#Career articles/10	5.617	-0.026	-0.027	-0.037**	-0.030	-0.036**
	(6.529)	(0.018)	(0.018)	(0.018)	(0.019)	(0.018)
#Career articles^2/100	74.16	0.001*	0.001*	0.001**	0.001	0.001**
	(263.1)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
#Field-top-20 articles among	1.249	0.005	0.003	-0.000	0.037	-0.002
reported 3 best publications	(1.165)	(0.051)	(0.051)	(0.051)	(0.053)	(0.051)
Cohort dummies		Yes	Yes	Yes	Yes	Yes
City size dummies		Yes	Yes	Yes	Yes	Yes
Field dummies		Yes	Yes	Yes	Yes	Yes
#Observations		1,537	1,537	1,537	1,482	1,537
Pseudo R squared		0.028	0.031	0.041	0.051	0.043

Notes: Robust standard errors are in parenthesis. ***Significant at the 1%, ** at the 5%, * at the 10% level. Cohort dummies are for those who entered in academia in the 1980s, between 1990 and 2004, and after 2004. Cities are classified into 6 categories based on size. There are 13 fields in the data.

Figure 1: Hours worked for the different tasks and probabilities of reporting the highest level of stress

