RIETI Discussion Paper Series 18-E-002

White Collar Exemption: Panacea for long work hours and low earnings?

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http://www.rieti.go.jp/en/

RIETI Discussion Paper Series 18-E-002
January 2018

White Collar Exemption:
Panacea for long work hours and low earnings?[1]

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Abstract

White collar exemption, an exemption rule for an overtime pay (OP) regulation, has emerged as a regulatory instrument to ameliorate two well-known features of full-time employees in Japan: long work hours and low earnings per hour of labor. Using a large cross-section sample of full-time employees in Japan, we empirically investigate the potential outcomes of the exemption rule. We use Rosen's model of labor markets to derive two testable hypotheses: relative to a more traditional OP-exempt labor contract, the exemption rule induces (1) more variability in work hours, but not necessarily shorter hours on average and (2) lower equilibrium wages. For identification, we combine a set of control strategies with stratified matching. To identify comparable subsamples, we exploit the fact that the likelihood of the OP-exempt status increases with firm size and population density even after conditioning on a number of job and household characteristics. The empirical results support our predictions. As with earlier studies, the OP-exempt status itself significantly increases both work hours and wages relative to the OP-regulated status. Yet, the exemption rule reduces both work hours and wages relative to the traditional OP-exempt contract although the differences are not statistically significant.

Keywords: White collar exemption, Long work hours, Overtime pay regulation
JEL classification: J33, J38

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[1]This study is conducted as a part of the project "Economics of Artificial Intelligence" undertaken at the Research Institute of Economy, Trade and Industry (RIETI). The author is grateful for helpful comments and suggestions by Discussion Paper seminar participants at RIETI.

1 Introduction

Overtime pay (OP) regulation and white collar exemption (WCE) are the two labor-law provisions, commonly employed around the world, to hit a balance between protection of employment and health of workers, on one hand, and enhancement of work performance and productivity, on the other hand. While the OP regulation requires employees to monitor work hours and pay for OP premiums for hours beyond 40 hours per week, WCE exempts certain types of non-manual office workers from these requirements. Because the WCE status allows flexible work scheduling, it has also been discussed in connection to alternative work arrangements that promote work-life balance. WCE has often been the center of heated political debates, not only because it can potentially affect a number of firms and workers, but also because there is a great deal of uncertainty regarding its economic consequences.[1]

By design, WCE is intended to influence two types of economic margins. First, WCE exempts eligible workers from the OP schedule. Hence, the exempt workers and the non-exempt workers face very different price incentives for their labor supply, which in turn also alter employers' demand for the two types of labor. Therefore, WCE may induce changes in equilibrium wages or labor hours or both for the exempt workers, purely through the price mechanism. Second, the WCE status also comes with work arrangements that allow eligible workers to work flexibly without monitoring and with more authority as to how and when to complete assigned jobs. This flexibility by itself is thought to increase labor productivity, at least for certain types of jobs that involve non-manual, non-repetitive tasks. Thus, the largest group of employees covered under the U.S. WCE comprises administrative, executive, and professional workers (Trejo, 1991).

An ample body of literature empirically investigated the impact of the OP regulation [e.g., Costa (2000), Hamermesh and Trejo (2000), and Trejo (1991, 2003)]. However, economic research to date has primarily focused on the first effect, but largely ignoring the second effect despite its economic significance. Trejo (1991), for example, examines the effect of the OP regulation on hours of work and wages. But his study focuses on the sample of workers who are paid on an hourly basis. By definition, these workers are subject to monitoring of work hours, and hence, do not enjoy the benefits of flexible work arrangements. Our paper attempts to disentangle these two effects of WCE, exploiting a unique regulatory setup in the Japanese labor market.

The Japanese labor market is known for its rigidity in personnel management: i.e., strict work-hour control, seniority-based salary system, and pre-scheduled promotion and tenure scheme. The rigidity is often criticized as one of the primary causes of two unfortunate characteristics of the full-time employees in Japan: i.e., long working hours and low earnings per hour of labor input. In response to rising concerns with this rigidity, the government made amendments to the LSA in 1988, effectively creating an analogue of WCE status to the OP regulation. In the Japanese regulatory context, this WCE analogue is called the

[1]For example, the U.S. Department of Labor updated the eligibility rules for the OP exempt status in May, 2016 and increased the salary threshold from the current \$455 per week to \$913 per week. In preparing for this increase, the DOL conducted an impact study, which concluded that "4.2 million workers will be directly affected by the rule, and 8.9 million currently overtime eligible workers will get strengthened overtime protections (p.2)... the rule will result in an average annual increase in pay to workers of \$1.2 billion per year (P.4)" (U.S. DOL, 2016).

discretionary work system (DWS). What makes the Japanese labor market suitable for our analysis is that there is another more informally defined traditional labor arrangement in addition to the official WCE arrangement. Japanese firms appoint employees conducting supervisory work to another informally defined arrangement. For example, an employer appoints an employee at a position that would involve supervisory tasks such as managing a large number of subordinates. We call this type of traditional labor arrangement the *supervisory work contract* (SWC). Most employees under the SWC hold no discretionary power over their work hours or workload, and hence, they often do not meet the DWS eligibility. Nonetheless, they form this informal labor contract with their employees without approval from the labor office, and exempt themselves from the overtime pay schedule. Consequently, we have three labor arrangements: regular OP workers, informally defined non-OP workers without merit of WCE, and official OP-exempt workers with full merit of DWS. This allows us to evaluate the potential outcomes of these alternative arrangements to disentangle the two effects of DWS mentioned above.

Our empirical study relies on a household survey we conducted in 2016, which covers a large cross-sectional sample of approximately 20,000 full-time workers in Japan. Our dataset contains rich information of job and individual characteristics but also includes a sufficiently large number of the OP-exempt workers. For identification, we exploit the fact that the likelihood of DWS status increases by firm size and population density, even after controlling for a number of job and worker characteristics. This occurs presumably because there are some unobservables that affect the economic value of DWS and other OP-exempt positions to firms and are correlated with firm size and population density (e.g., legal and administrative costs of institutionalizing the OP-exempt status). These unobserbables, in turn, are also likely to enter both the work hour and the wage equations directly. Hence, these covariates serve as good controls for these unobservables. To reduce possible biases, we explicitly stratify our sample by firm size and population density as well as propensity scores based on other covariates, and estimate average treatment effects using the matched subsamples within each stratum.

Our results are as follows. First, the OP-exempt status itself significantly increases work hours, yet the exempt workers earn higher wages per hour so as to compensate for the long work hours. This result is consistent with the existing literature on the effect of OP regulation (Costa, 2000; Hamermesh and Trejo, 2000; Trejo, 1993). In addition, we find that the DWS status tends to reduce both work hours and wages relative to the SWC. Though these differences are not statistically significant when averaged over stratified subsamples, the wage differentials are statistically significant in a few strata where subsample size is relatively large. On the other hand, the work-hour differences have large standard errors, and thus, are not statistically significant in all strata. We take these results as evidence in support of our theoretical predictions. Our model suggests that when *jobs* are assigned to the DWS, it induces self-selection of workers with different productivities and preferences into the DWS. Some of these workers may work longer while others may work shorter, depending on their productivities and preferences. In the meantime, all these workers who self-selected into the DWS positions prefer the DWS over the SWC. This allows firms to lower equilibrium wages so as to cover the institutional cost of the DWS. Hence, our results are largely in line with our economic predictions. Moreover, our results are also suggestive of the success of our control strategies — the OLS regression show that work hours and wages tend to be *higher*, not lower, under the DWS than the SWC. We suspect that the OLS results caught up spurious correlations that come from the fact that work hours and wages are higher at larger firms and in urban areas.

Our study complements three areas of research. First, there is a growing interest among economists on the economic consequences of alternative work arrangements (Bloom et al., 2015; Mas and Pallais, 2017; Kaur et al., 2015), due to a well-documented rise in employment under such arrangements over the last three decades (Katz and Krueger, 2016; Oettinger, 2011). Bloom et al. (2015), for example, examined the impact of a work-from-home (WFH) arrangement, or telecommuting, for a Chinese travel agency. Using a randomized controlled experiment, they showed that there was a substantial gain, both in terms of work performance and worker satisfaction, from the WFH arrangement at call center in China. Kaur et al. (2015) examined self-control problems at work for data entry workers. Our study most closely parallels the work by Mas and Pallais (2017). They conducted a discrete choice experiment for a national call center in the U.S. to estimate the value of alternative work arrangements. They find that the average worker is willing to take a 20 percent wage cut to avoid employer discretion in work scheduling and 8 percent cut for a WFH option (Mas and Pallais, 2017). Their results are consistent with ours — wage differentials arise so as to equate the utility of marginal workers in jobs with and without flexible work arrangements.

Second, we complement a large literature investigating the effect of the OP regulation on work hours and wage earnings (e.g., Costa, 2000; Hamermesh and Trejo, 2000; Kuroda and Yamamoto, 2012; Trejo, 1991, 1993). These studies generally find, as in ours, that the OP-coverage reduces work hours and prevalence of overtime work while also reducing hourly wages. Of these, ours is most closely related to Kuroda and Yamamoto (2012). They use a Japanese dataset similar to ours, employ propensity score weighting to control for observables, and compared OP-exempt workers with regular OP workers. They find, somewhat differently from the previous studies (and ours), that although the OP-coverage status tends to reduce work hours, it does not significantly influence hourly wages. Our study differs from Kuroda and Yamamoto on three important accounts. First, they focused on the labor-market outcomes of supervisory/managerial workers assigned to SWC, while ours examines the differential impacts of DWS and SWC among OP-exempt workers. Second, in hypothesizing the potential impacts of DWS over SWC, we extend Rosen's model of labor markets, going beyond the conventional fixed-wage and fixed-job models of OP regulation. Third, we exploit the richness of our data, both in size and a number of observables, in setting up our control strategies carefully in constructing our matching estimator. Our results confirm a more general finding of these earlier studies on OP regulation — the conventional fixed-wage and fixed-job models cannot "completely account for observed labor-market outcomes" (p. 739, Trejo, 1991).

Lastly, our study is also related to studies that attempt to investigate the relation between individual preferences for job amenities and compensating wage differentials, building upon Rosen's framework of hedonic pricing in labor markets. An enormous body of literature has attempted to get at this relation using cross-sectional or longitudinal data (Brown, 1980; Duncan and Holmlund, 1983; Hwang et al., 1992). Estimates from these studies are often unstable or wrong-signed, presumably due to the presence of unobservables, measurement errors, or search frictions (Mas and Pallais, 2017; Lang and Majumdar, 2004; Bonhomme and Jolivet, 2009). Like these previous studies, ours uses cross-sectional data, and hence, is most likely subject to the same kind of bias. To reduce the bias, we employed a matching approach along with a set of control strategies. Recent studies have suggested the usefulness of the matching approach in reducing bias from the unobservables in observational studies. For example, Dehejia and Wahba (1999), in their study of the impact of a job training, demonstrated that the estimate from propensity score matching (PSM) using cross-sectional data comes sufficiently close to the estimate from the randomized controlled trial. In ours, we strengthen the matching approach by explicitly stratifying on two control variables that account for unobservables and propensity scores that account for a number of job and worker characteristics. Our results indicate that preferences for flexible work arrangements do exist and translate (weakly) to the market wage differentials, but that these differentials become right-signed only after conditioning on comparable samples using the matching approach.

The rest of the paper is organized as follows. In Section 2, we briefly describe institutional background. Section 3 discusses a simple model we construct, building on Rosen's model of labor markets. Section 4 describes an identification strategy and data used in our empirical analysis. The main results are presented in Section 5. The last section concludes the paper.

2 Institutional Background

All employees in Japan, either full-time or part-time, are subject to the Labor Standards Act (LSA) of Japan. Much like the Federal Labor Standards Act in the U.S., the LSA imposes two kinds of wage regulation on the Japanese labor market: a minimum wage and an overtime pay (OP). In principle, the OP regulation requires an overtime wage premium for work hours exceeding 40 hours per week or 8 hours per day. The wage premium is typically 25% of the regular-hour wage rate, but can be increased up to 50% for work hours performed on pre-scheduled holidays. To comply with the OP regulation, employers must set starting time and ending time of regular hours, and record working hours of their employees for each day.

This rigidity in applying the OP regulation created highly inflexible work-hour management practices among the Japanese firms. In response to rising concerns with this rigidity, the government made amendments to the LSA in 1988, effectively creating two forms of exception to the OP regulation. The first was to allow for more flexible implementation of the OP regulation. Under the amendments, employers are allowed to average out work hours over a certain period (other than per day/week), and be exempt from paying the overtime premium as long as the averaged work hours do not exceed the legal limit of 40 hours per week (the system is known as the *variable hour system*). Furthermore, under the amendments, employees can choose their own starting time and ending time, deviating from regular hours set by employers (known as the *flexible time system*). For either system, employers need to form an agreement with employees. According to the General Survey on Working Conditions (GSWC) in 2012 (Ministry of Health, Labour and Welfare), 51.3% of firms with 30 employees or more use either the variable hour system or the flexible time system.

The second form of exception was to allow several types of professions to be exempt from the OP regulation. Initially, two types of professions were made exempt from the OP regulation. The first type is those who regularly engage in work outside business offices such as sales personnel and travel attendants (referred to as *off-site work* under the LSA). The second type is those conducting professional/expert services such as researchers, product developers, IT system engineers, and fashion designers (referred to as *professional work* under the LSA). In 1997, the list was expanded to include other types of professionals such as lawyers and accountants. In 2000, further amendments were made to the LSA, and those engaging in *management-related work* were also made exempt from the OP regulation.

With the exempt status, employees are deemed to have worked for agreed-upon work hours (often, the legal limit of 40 hours per week) regardless of their actual work hours, and employers are also exempt from monitoring their employees' work hours and paying for OP compensations (they still need to pay the compensation for work hours during night or on holidays). One important aspect of the regulation is that the exempt status for these professions is not granted automatically: Each employer must reach an agreement with each of their employees (or a representative of employees) and get an approval from the labor inspection office. Consequently, many of the professional-work and management-work positions do not receive the legal exempt status in practice. To distinguish from non-exempt positions, the positions that are officially OP-exempt are called *discretionary work system* (DWS) positions in the Japanese regulatory language. According to the 2012 GSWC survey, only 3% of firms with 30 employees or more adopt the DWS.

The Abe administration recently approved the action plan for the Work Style Reform (WSR).[2] At the heart of the WSR lies the debate concerning the White Collar Exemption (WCE) rule. Roughly speaking, the WCE rule (in its current debate) attempts to expand the coverage of the existing DWS for virtually all full-time employees earning the pre-tax annual income of 10.75 million yen or higher. Currently, the DWS regulation concerning the management-related work is more stringent than that on the professional work — the former must secure at least 4/5 votes from a labor-management committee for approval and 1/2 of members of the committee must be employee representatives. Meeting this requirement is quite hard and costly for firms in the Japanese context. Often, committee members are selected from the members of a pre-existing labor union. But only a small fraction of companies have their own labor unions in Japan, and the smaller the companies are, the more unlikely they have their own labor unions (MLHW, 2017). Consequently, many of the supervisory positions have not yet been granted the exempt status (See also Table 1 discussed below). The WCE is, therefore, expected to primarily increase the number of management-work positions that may be covered under the DWS.

Central to the debate is a tension between the intended versus unintended consequences of the DWS. While the DWS is intended to encourage flexible and efficient use of work hours (and thus labor productivity), there is also a concern that the DWS may simply offer a loophole that would allow employers to avoid paying for overtime work. What complicates the debate is the fact that traditionally, Japanese firms appoint employees conducting supervisory work to another informally defined arrangement. For example, an employer appoints an employee at a position that would involve supervisory tasks such as managing a large number of subordinates. We call this type of traditional labor arrangement the *supervisory work contract* (SWC). Many Japanese firms have been abusing this arrangement. Most employees under the SWC hold no discretionary power over their work hours or workload,

[2]Some called the WSR "a major reform in the history of postwar Japan's labor laws and regulations" (The Cabinet Office, March 28, 2017).

and hence, they often do not meet the eligibility for the DWS. Nonetheless, they form this informal labor contract with their employees without approval from the labor office, and exempt themselves from the overtime pay schedule. In the past, employers lost virtually all lawsuits concerning this labor contract. However, employees rarely file lawsuits against such labor contracts for fear of losing job security, and hence, such arrangements are still very common in Japan.

Table 1 helps us demonstrate some of these points. The table shows the distribution of employees working under alternative labor contracts by industry, occupation, firm size, and population density. The data for the table come from a national survey we conducted in 2016, the details of which shall be discussed in Section 4. Of the 40,418 employees in the sample, 19,828 (49.1%) were regular full-time employees. Of these full-time employees, 22% work under variable/flexible hour system, 3.7% work under the DWS, and 6.4% work under the SWC.[3] As discussed above, the OP-exempt status is still not prevalent in Japan, and substantially fewer employees are covered under the DWS than under the variable/flexible-hour systems. The prevalence of the DWS is even lower among management-work positions than among professional-work positions. Importantly, a non-negligible share of full-time employees still work under the SWC despite its legal status. Furthermore, the prevalence of the DWS increases with firm size and with population density. This is consistent with our earlier point — it is costly to meet the regulatory requirement and it is easier for larger companies located in urban areas to adopt the DWS. We explicitly make use of this in our empirical strategy.

We now turn to Table 2, which reports the distribution of working hours on a typical week over alternative work-hour systems by industry, occupation, firm size and population density. There is surprisingly consistent incidence of long working hours in the sample of full-time employees in Japan across industry and occupation. The overall mean of the usual working hours is 45.9 hours per week. This number is higher than comparable figures in U.S., but is consistent with other studies on Japan — full-time employees work substantially longer than part-time employees in Japan. The mean working hours stay roughly the same across industry, occupation, firm size and population density, but seem to vary across work-hour systems. Those under the regular OP regulation on average work 45.2 hours per week whereas those under the DWS and the SWC work longer —47.7 and 47.1 hours per week, respectively. This tendency is quite consistent across industries and occupations. It is this reason why the WCE is often criticized as legalizing long working hours without overtime pay by increasing the coverage of the DWS to more positions, either from the traditional SWC or other non-OP-exempt positions. A tragic incident further fueled this concern. In 2016, a young female employee, a graduate of the University of Tokyo and working for a highly well-recognized advertising company *Dentsu*, committed suicide allegedly due to her extremely long working hours.

These average working hours are, however, not directly comparable across work-hour systems since job and individual characteristics also differ substantially across work-hour systems. For example, those under the SWC would be typically at the managerial rank,

[3]In the dataset, we cannot distinguish between off-site work system and DWS. Hence, the DWS counts include those who might be working under the off-site work system. We expect that the off-site workers mostly concentrate in the sales/service occupation.

where demand for work hours is high. Those under the DWS are typically male, highly educated individuals. These demand/supply factors might be the primary source of long working hours rather than the work-hour system per se. What we would like to gauge is whether converting to the non-OP positions would cause employees to work longer, holding other job and individual characteristics constant.

3 Alternative Models of Labor Supply

Different models of labor markets produce different predictions about the impact of overtime pay regulation. Trejo (1991) discusses a sharp contract between the fixed-wage model of Ehrenberg (1971) versus the fixed-job model of Lewis (1969). Roughly, the former can be cast as a model that assumes perfectly elastic supply of labor whereas the latter as a model that assumes perfectly inelastic supply. Consequently, the former model predicts that when the OP regulation places an exogenous increase in the cost of hiring labor, the equilibrium labor hours be shrunk while the equilibrium wage remains fixed. In contrast, the latter model predicts that the equilibrium wage be reduced so as to completely offset the OP regulation while the equilibrium labor hours remain fixed. Taken together, these models essentially imply the OP regulation would reduce either labor hours or wages, or both when labor supply is less than perfectly elastic or inelastic. In other words, these models predict that holding all job and individual characteristics constant, assignment of a job to the OP-exempt status should increase either the labor hours or the wages or both for workers performing that job.[4]

The problem, however, is that these models cannot say anything about the potential impact of the DWS relative to the SWC. Neither follows the overtime pay schedule, and hence, the aspects of economic incentives the above models can capture stay the same between the two arrangements.[5] However, there is one important channel in which the DWS positions may differ from the SWC positions. The DWS regulation requires that an agreement must be reached prior to its implementation about the expected workload and tasks to be undertaken during some agreed-upon hours of work (usually the legal limit of 40 hours per week). The employees are then allowed to work freely, without monitoring, as they see it desirable for completing the assigned workload. Hence, the DWS makes the bargaining process between the employer and the employees more explicit and transparent.

There is a reason to believe that this channel is quite important for labor markets in Japan. Irrespective of what economic models to take in, economic efficiency in labor markets requires that workers can sell and buy their labor hours freely without market frictions. In practice, however, virtually all companies in Japan require the minimum hours of work,

[4]A number of previous studies have tested fixed-wage and fixed-job models using data from various countries. For example, evidences are from Canada (Friesen, 2001; Skuterud, 2007), the United Kingdom (Bell and Hart, 2003) and Japan (Kuroda and Yamamoto, 2012), and many from the United States (Barkume, 2010; Costa, 2000; Hamermesh and Trejo, 2000; Trejo, 1991, 1993, 2003). The findings are mixed in that neither of these two models are found to be completely invalid in these studies. Which model is more relevant depends on countries and types of workers.

[5]Strictly speaking, the SWC is not granted a legal OP-exempt status, and hence, the risk of facing a lawsuit may affect the firm behavior. However, there is a reason to believe that is unlikely the key driver for observable differences, if any, in labor hours or wages between the two arrangements.

usually set at the legal limit of 40 hours per week, be supplied. As a result, weekly work hours of full-time employees follow a roughly exponential distribution with 40 hours per week as the left-side bound (see Figure A.1 in the Appendix). That supply of labor cannot be traded freely across workers or firms, and must stay within the boundary of the job for which employees are hired. Given this rigidity, the Japanese labor market may be better modeled a la Rosen's model of labor markets as an implicit market for job attributes (Rosen, 1974; Rosen et al., 1985; Rosen, 1986).

In Rosen's framework, the labor markets are similar to a "marriage" market matching employees with various individual attributes (talents, skills, preferences) and jobs with different work attributes (wages, tasks, work environments). In this market, a worker sells her labor service along with her talents and skills and buys a job that comes with a package of various job attributes. Equalizing or compensating wage differentials arise naturally so as to compensate for differences in work attributes — jobs that offer unfavorable working conditions such as risky activities and onerous tasks must pay more than average wages to attract employees. This Rosen's framework can be tailored to give some testable predictions about the impact of the DWS on wages and work hours relative to the SWC.[6]

To illustrate our points, consider a labor market in which workers have homogenous tastes for work hours l and wages w, but differ in skills or productivity φ. Heterogeneity in tastes can be incorporated into the model, but adds very little to what we discuss below at the expense of notational ease. Workers perform tasks, whose outputs are measured conveniently by t, through a production technology $t = h(l, \varphi)$. To focus on essentials, consider two types of jobs, one that requires demanding tasks t_H and another that requires much less t_L. The t_H jobs may be supervisory work or professional work that can be potentially covered by the DWS. Suppose for the moment that two types of jobs are offered at given wages w_L and w_H, respectively.

Assume that h is uniquely invertible with respect to l, and that l increases with t and decreases with φ. It follows then that preference relations over the (l, w) space can be uniquely mapped to those over the (t, w) space, and that workers will have heterogeneous preferences in the (t, w) space even if they have homogenous preferences over (l, w). Figure 1 depicts an example of such preference relation in the (t, w) space. This worker is currently indifferent between a job package A versus another job package C. Hence, if the worker is given two job packages A and B (instead of C), she would prefer to choose A. In Rosen's language, the compensating wage differential z required for this worker to take up more onerous task t_H instead of t_L is larger than the actual wage differential Δw.

A firm's demand for labor can be also modeled almost symmetrically. Suppose that firm's profit π is given by $\pi = f(t, \nu) - w$, where ν describes firm's productivity in generating profits from output t. Assuming sufficient concavity of f in t, the iso-profit curve in the (t, w) space is convex, as shown in Figure 1. Given the market wages w_L and w_H, this firm would attain higher profits from offering job type B than job type A. This firm is willing to compensate as much as z, yet the actual wage differential is Δw. Hence, if the market wages remain as they are, the firm would fetch an economic rent equaling $z - \Delta w$. The discussion so far assumed

[6] As discussed inTrejo (1991), the fixed-job model also has some roots in Rosen's framework. However, the fixed-job model leaves out one important aspect of Rosen's model — both labor hours and wages are part of job attributes that must be negotiated and determined via market equilibrium, and hence, neither attributes should stay "fixed" over different regulatory arrangements.

wages are fixed as w_L and w_H. Rosen (1986) has shown how equilibrium wages would arise through the market clearing condition, which can be defined explicitly by assuming some distributions for φ and ν.

Now let us introduce another job characteristic s, which equals 1 if a job is converted to the DWS. By assumption, only the t_H job can be converted. The promise of the DWS is that it gives more freedom and authority as to how a worker may complete the assigned task t_H. Because workers can always choose to work in the same way without adjusting their work hours, all workers should weakly prefer this added work "amenity," regardless of whether it actually reduces their labor hours or not. Then this added work attribute would shift the indifference curve down for every worker who strictly prefers it. On the other hand, as discussed in Section 2, converting a position to the DWS is costly to firms. Hence, if there is no productivity gain from the arrangement, this added job feature might also shift down any firm's iso-profit curve. These changes are illustrated with IC' and IP' in Figure 1. One important promise of the DWS, as its proponents argue, is that this added job feature should also increase worker productivity — workers know their best in what they do and how to achieve the given task, and hence, they work most efficiently if they are given more authority as to allocation of their own labor. If the productivity gain is sufficiently larger than the cost, firm's iso-profit curve might indeed shift upward (IP'') instead of downward (IP').

The reasoning suggests, unfortunately, that the impact of this added work attribute on either the equilibrium wage differential or labor hours is unclear. Because virtually all workers prefer having this attribute, their indifference curves would shift downward. But the iso-profit curves might shift up for some firms and down for other firms. Hence, the compensation required to accept the onerous task is lower for all workers while the compensations firms are willing to offer for it may be higher or lower. This should bring the equilibrium wage differential smaller, though the magnitude of the impact may not be large since firms may enjoy productivity gains. Moreover, the impact on the labor hours is indeterminate. On one hand, the DWS allows workers to work flexibly and efficiently, and hence, in some cases, workers may be able to cut back hours of work. On the other hand, the added feature will attract more inefficient workers to take up the onerous task, and hence, this selection may lead to longer average work hours. This gives us a good reason to take this to an empirical study, which we shall turn to below.

4 Empirical Strategy

4.1 Identification and Estimation

For outcome variables of interest y (i.e., work hours l or wages w), our primary interest lies in identifying the average treatment effect (ATE)

$$ATE = E[y_{ti} - y_{si}],$$

where y_{ti} and y_{si} denote potential outcomes under alternative labor arrangements $t, s \in \{0, 1, 2\}$. For ease of interpretation, we let $t = 0$ denote regular OP status, which serves as the base for evaluating the impact of the SWC ($t = 1$) and the DWS ($t = 2$). The empirical challenge is that we have only cross-sectional variation in y and covariates to identify these ATEs. Hence, we combine a matching estimator with a set of control strategies.

To clarify our empirical strategy, note that ATE for each $t = 1, 2$ is given by:

$$\begin{aligned} E[y_{ti} - y_{0i}] &= E_X\{E[y_{ti} - y_{0i}|X_i]\}, \\ &= E_X\{E[y_{ti}|X_i, D_{ti} = 1] - E[y_{0i}|X_i, D_{0i} = 1]\}, \\ &= E_X\{E[y_{ti} - y_{0i}|X_i, D_{ti} = 1] + E[y_{0i}|X_i, D_{ti} = 1] - E[y_{0i}|X_i, D_{0i} = 1]\}. \end{aligned}$$

The last two terms in the braces in the last expression are the selection bias term. Thus the key identifying assumption is that these terms cancel out after conditioning on covariates X_i:

$$E[y_{0i}|X_i, D_{ti} = 1] = E[y_{0i}|X_i, D_{0i} = 1]. \tag{1}$$

That is, in the absence of treatment, the expected outcome is the same between the treated and the untreated after conditioning on X_i. With this assumption, it also holds that the observed difference in outcomes between the treated and the untreated (i.e., a sample analogue of the terms in the braces of the second line) gives us a sample analogue of the average treatment effect on the treated (ATET) for given X_i (i.e., the first term inside the braces of the third line).

The question is what variables serve as good controls X for (1). Obvious candidates are variables that can proxy "tasks". As discussed in Section 3, Rosen's framework predicts that labor hours and wages should differ across workers assigned to different tasks. Yet, as discussed in Section 2, workers assigned to DWS/SWC positions may be assigned to tasks that are substantially different from those assigned to regular OP positions. Rosen's framework also tells us that there is generally a sample selection — workers self-select into tasks that better match their preferences and skill sets. Therefore, we need to control for all observable job characteristics as well as individual characteristics. Fortunately, our dataset allows us to use an extensive number of controls for employer/employee characteristics that are not usually available in conventional surveys. In addition to traditional controls such as industry/occupation types, age, education, and marital status, we use job rank, a number of subordinates, department size, on-the-job skill requirements, and measures of employer inefficiency.

We, however, still have concerns that these observables may not saturate all of the factors in (1). Ideally, we would like to have instruments that can exogenously shift the assignment status D_t but does not affect outcomes y. Our discussion in Section 2 indicates that the likelihood of OP-exempt status increases at larger firms or firms in urban areas. This occurs presumably because cost (per worker) of converting a position to OP-exempt status decreases as firm size or population size increases due to scale economies and search frictions. This suggests that some workers at smaller firms or firms in non-urban areas who could have been converted to OP-exempt status, but work as regular OP status, yet work on otherwise the same job task as those with OP-exempt status at larger firms or firms in non-urban areas. Hence, firm size and population density could be a good candidate for such instruments. Unfortunately, these variables do not qualify as instruments because they are also correlated with outcome variables — workers at larger firms or firms in urban areas tend to work longer and earn higher wages. However, this logic suggests that these are indeed good controls to satisfy (1). That is, if firm size and population density capture unobservable labor demand or tasks that affect wages and work hours, and if these also shift the likelihood of labor arrangements without influencing workers' choice of labor hours directly, then conditioning on these variables should be able to remove much of the bias coming from these unobservable demand factors. Our estimation strategy uses this argument explicitly.

Let us partition X into those that control directly for observables X^o and those that control for unobservables X^u. X^o has a substantially higher dimension (i.e., more variables) than X^u. Hence, we control for X^o using propensity scores and for X^u using strata of X^u. The problem is that we have two treatment levels $t = 1, 2$. Though there are methods available for multi-valued treatments as Cattaneo (2010) and Cattaneo et al. (2013), these methods somewhat obscure identification of treatment-control structures. In this study, we wish to identify the causal effect using the *same* base subsample to evaluate the two potential outcomes against the base outcome. In other words, we wish to control for the same propensity score rather than two separate propensity scores corresponding to two different treatments. The reason for this is that the DWS and the SWC are both OP-exempt. The primary difference between the two is their legal status, the former is formally approved and the latter is not. Hence, employees under the DWS and the SWC tend to work on very similar tasks, once we control for observable covariates X^o.

Given the above reasoning, we use the following two-step matching strategy. We first run logit to obtain a single propensity score $P_n(X^o) \equiv P(D_1 = 1 \text{ or } D_2 = 1|X_i^o)$ using only X^o. Then we calculate conditional sample averages on each of the stratified sample on $P_n^o(X^o)$ and X^u. Then for each treatment t, compute the weighted average using the relative size of strata $s(P_n(X^o), X^u)$ as weights. That is,

$$ATE_t = \sum_X \delta_t(X) s(P_n(X^o), X^u),$$

where

$$\delta_t(X) = E[y_t|P_n(X^o), X^u, D_t = 1] - E[y_0|P_n(X^o), X^u, D_0 = 1].$$

In theory, this estimator works in the same way as a simple propensity score matching (PSM) estimator with both X^o and X^u included in the first stage. It is known, however, that PSM and fully blocked matching estimators often do not produce the same results, and that PSM sometimes exacerbates model dependence as it ignores some of the information available in full blocking (King and Nielsen, 2016).

Figures 2 and 3 illustrate the idea behind this matching estimator. The figures show box diagrams of weekly work hours and logged hourly wages under alternative labor contracts by firm size and population density on a stratified subsample with $0.2 \leq P_n(X^o) \leq 0.4$. The figures signify several features of our control strategies. Because all figures are conditioned on propensity scores, these box diagrams control for observable job/worker characteristics that would implicitly define "tasks" assigned to workers. Nonetheless, the figures demonstrate substantial differences in distribution of outcomes over firm size and population density. Variance tends to be higher for larger firms in more urbanized areas, but these distributional differences get smaller once we control one of these dimensions (i.e., holing either firm size or population density). As expected, work hours under the SWC/DWS have larger variance than those under the OP contract. The same is not true with hourly wages, however. Indeed, variance seems smaller for the SWC/DWS positions than for the OP positions. This is expected. Because OP-exempt status allows workers to choose their work hours more flexibly according to their own preferences and productivity, the dispersion in work hours should reflect the dispersion in these preferences and skill sets. On the other hand, hourly wages should converge to *average* worker productivity through market mechanism for given job/worker characteristics. As expected, hourly wages seem to differ systematically by firm size and population density even after controlling for other observable covariates. Hence, given these distributional differences, simple PSM on the pooled (unstratified) sample may bias the estimates of ATEs.

4.2 Data

This study uses a large cross-sectional data of full-time employees from a nationwide internet survey we conducted in December 2016. The survey covered those who had jobs at the time of the survey. Out of the 40,418 respondents, 19,828 are regular full-time employees. The OP-exempt status is not yet prevalent in Japan, but our large-scale survey secures a relatively large number of the OP-exempt workers even after we limit our sample to employees in selected industries and occupations and remove observations with missing values.

We obtain our working sample as follows. In order to test the theoretical predictions derived in Section 3, our sample includes employees under the regular hour system and the OP-exempt (i.e., SWC and DWS), but it excludes employees under flexible/variable hour system. We further limit our sample to employees in construction, manufacturing, IT/telecommunication, wholesale/retail trade, finance/insurance, and real estate. The numbers of employees under the SWC or the DWS are not sufficient in other industries. For the same reason, we limit our sample to employees whose occupation is categorized as management/supervisory, professional/technical, administrative, clerical, sales, or service. Out of our working sample of 7,416 observations, there are 563 SWC workers (7.6%) and 406 DWS workers (5.5%). Large-scale household surveys such as Employment Status Survey and Population Census by Ministry of Affairs and Communication do not ask about work arrangements. Although General Survey on Working Conditions by Ministry of Health, Labour, and Welfare ask such information, it is a firm-level survey and wages and work hours of each employee are not available. Keio Household Panel Survey, which Kuroda and Yamamoto (2012) use in their analysis, asks about work arrangements as well as individual characteristics. However, the survey covers approximately 7,000 individuals per year, even including non-regular employees and people out of employment. Our survey covers a larger number of regular full-time employees.

The outcomes of interest in our analysis are hours worked per week and hourly wage. The survey asked what time a respondent starts and finishes working in a typical day. Using the answers, we calculate hours of work per day, and then, we obtain weekly work hours by multiplying daily work hours by 5. We compute an hourly wage by dividing annual income by annual work hours, which are derived from weekly work hours. Table 3 reports the descriptive statistics by the OP status. The weekly work hours of the SWC and DWS workers are significantly longer than the OP workers on average by 1.948 and 2.466, respectively. Similarly, the SWC and DWS workers receive statistically significantly higher hourly wages than the OP workers by 40% and 33%, respectively. On the other hand, there is no significant difference in weekly work hours between SWC and DWS while the DWS workers receive lower hourly wages than the DWS workers by 7.5%, which is significant with a p-value of 0.026. Therefore, these unconditional differences are in line with our theoretical predictions.

We shall see whether these differences still remain even after controlling for individual and job characteristics that determine work hours and hourly wages. The list of observable characteristics, X^o, includes individual characteristics such as age, years of school, gender, marital status, and whether there are small children who are younger than 3rd grade at home as well as job characteristics such as industry and occupation categories. However, even conditioning on these standard observables, workers under different work arrangements are likely to face substantially different job tasks. To proxy job tasks more adequately, X^o includes additional job characteristics.

Besides its large sample size, the virtue of our survey is to enable us to use an extensive number of controls for job characteristics, some of which are uniquely asked in our survey and not available in other conventional surveys. The job characteristics such as department size, job rank, the number of subordinates, and on-the-job skill requirement[7] obviously affect workloads. We also use the length of reimbursement for work-related expenses as a measure of employer inefficiency and a dummy indicating whether an employer adopts multifaceted personnel evaluation System (360 Degree Feedback system) in evaluating performance. Along with standard individual and job characteristics, these unique job characteristics are able to proxy job tasks reasonably well. The descriptive statistics of X^o are presented in Table 3.

Despite the richness of job characteristics, X^o is unlikely to be a complete set of characteristics that determines wages and work hours. There are likely to be some unobservable characteristics that determine both the OP-exempt status as well wages and work hours. Ignoring such unobservables presumably causes bias. As discussed above, the key identifying variables in our empirical strategy are the size of firm and the population density of municipality of residence. The likelihood of OP-exempt status is closely related with firm size and population density. At the same time, these variables supposedly capture unobservable labor demand factors that affect wages and work hours. Thus, we label these variables X^u. By conditioning on X^u explicitly, we attempt to reduce much of potential bias due to the unobservable factors. To do so, we stratify the sample based on firm size and population density, the latter of which is divided into three groups by its tertiles. At the first step, we obtain the propensity score of being the OP-exempt by using X^o, $P_n(X^o)$. Then, we further stratify a subsample within each stratum into intervals of 0.05 points of $P_n(X^o)$ from $P_n(X^o) = 0.05$ up to $P_n(X^o) = 0.60$. Our estimates of ATE are computed as the weighted average of the differences between alternate work arrangements (OP, SWC, and DWS) within each stratum. For inference, standard errors are estimated using a bootstrap method. The next section discusses the estimation results.

[7] The survey asked a respondent to allocate 100 points to each category of skill/ability that he/she find necessary to complete his/her usual work tasks. Skill categories include "ability to think logically," "interpersonal skill," "leadership skill," "ability to think creatively," and "language and arithmetic capacity." The last two categories are excluded to avoid multicollinearity.

5 Results

The estimated ATEs for weekly work hour and logged hourly wage appear in Table 4. In addition to the stratified matching estimates, the table also reports the OLS and propensity score matching estimates for comparison. The OLS regresses the outcome variables on the dummies of SWC and DWS statuses as well as X^o and X^u. The difference between DWS and SWC is estimated by taking difference between the coefficients on the dummies. The PS matching estimator makes pair-wise comparisons over the alternative work arrangements based on the pooled (unstratified) sample. That is, the propensity score is obtained using both X^o and X^u.

As expected, the OP-exempt workers work longer and receive higher wages than the regular OP workers. The stratified matching estimates show that the average weekly work hours for SWC and DWS workers are statistically higher than for the OP workers by 2.2853 and 2.0506, respectively. These differences are comparable with the unconditional differences shown in the previous section. The stratified matching estimates also reveal that the hourly wages for the OP-exempt workers are higher than the non-exempt workers. The estimates indicate the SWC and DWS workers receive higher wages than the OP workers by about 11% and 6%, respectively. Unsurprisingly, conditioning on X^o and X^u results in much smaller differences in hourly wage than the unconditional differences. Yet, these differences remain statistically significant.

Our findings do not support either fixed-wage or fixed-job models. As opposed to the predictions from these models, our findings indicate that the OP-exempt status increases both work hours and hourly wages. This result is reasonable when labor supply is neither perfectly elastic nor perfectly inelastic as discussed in Section 3. It also agrees well with the result by Trejo (1991), which suggests that the wage adjustments occur as the fixed-job model predicts, but these adjustments are not large enough to offset the effect of OP-regulation on work hours completely. Our result differs from previous Japanese evidence. Kuroda and Yamamoto (2012) find that although the OP-exempt status makes work hours longer but does not increase hourly wages, which in line with the fixed-wage model.

We find evidence supportive of our theoretical predictions from the Rosen's model. First, as the model predicts that the DWS does not necessarily shorten work hours relative to SWC, the stratified matching estimate shows no statistically significant difference in weekly work hours between DWS and SWC. The standard error is much larger relative to the estimate, and then the p-value exceeds 0.75. Thus, the difference is far from significant. Second, the sign of the stratified matching estimate is in line with the model prediction: the DWS workers receive lower wages than the SWC work. Even though it is statistically insignificant in a two-tail test at conventional levels of significance, we are able to reject the hypothesis that the DWS workers receive higher wages than the SWC workers in a one-tail test with a p-value of 0.0791. Given more flexibility in determining hours of work, the DWS workers are willing to accept lower wage compensation for onerous tasks compared to the SWC workers. Our theoretical models are supported by empirical findings at least weakly.

On the other hand, both the OLS and PS matching estimators yield a contrasting result. These estimates indicate that the DWS status increases hourly wage relative to the SWC. The OLS estimate is in fact statistically significant at the 5% level. These estimates are potentially biased due to a failure in capturing systematical differences in unobservable labor demand factors. Not only the likelihood of the OP-exempt status but also unobservable labor demand factors presumably differ by firm size and population density. By stratifying these variables explicitly, we try to control for these unobservables as well as controlling for observables characteristics. That is, we attempt to identify comparable subsamples within each stratum. In order to explore this point more, we estimate the ATEs by strata of firm size and of population density.

Table 5 reports the estimation results by strata. The "overall" estimates correspond to the stratified matching estimates reported in Table 5, and these estimates are computed as the weighted averages over strata. As for weekly work hour, it is found that as expected, differences between DWS and SWC are not statistically significant from zero at any single stratum, with huge standard errors. On the other hand, the hourly wage differences are found to be statistically significantly at larger firms at the 10% level of significance and in urban areas at the 5% level of significance. OP-exempt workers are more likely to appear at larger firms and firms in urban areas since these firms face lower costs per worker of converting a position to OP-exempt status as we argue in Section 4. Thus, we can keep a sufficient number of observations of the OP-exempt to make reliable inference in these strata. On the other hand, the strata of smaller firms and non-urban areas tend to contain smaller numbers of the OP-exempt. Figures 2 and 3 elucidate this problem. The top-left box in these figures (i.e., small and low density strata) shows no observations of DWS. Lack of OP-exempt workers makes it difficult to yield reliable estimates in these strata. With relatively large effective sample sizes in large and high population density strata, we find that hour wages are lower for DWS than SWC as the model predicts.

In sum, our estimation results show that the SWC and DWS workers tend to work longer on average than the regular workers, and the longer work hours are compensated by higher hourly wages. We further find evidence supportive of the predictions from our model following Rosen's framework that on average, the DWS status tends to reduce wages relative to the SWC but not necessarily hours of work.

6 Conclusion

OP regulation and WCE have been at the center of recent debates on labor market reforms in Japan. WCE aims to ameliorate long work hours and low earnings per hour of full-time employees in Japan. In spite of its economic and policy importance, there has so far been little empirical evidence about this issue. This paper empirically investigates the impacts of WCE on weekly work hours and hourly wages using large cross-sectional data in Japan. In addition to the price incentives created by an exemption to pay OP-premium, WCE is indented to provide an additional economic incentive by allowing eligible workers to work flexibly. We also examine the impact of this margin by making use of a unique feature of the Japanese labor market, where two OP-exempt work arrangements exist: *discretionary work system* (DWS) and *supervisory work contract* (SWC). While DWS workers have full merit of WCE, SWC workers hold little discretionary power over their work hours.

Our results signify the importance of carefully delineating these two margins of the WCE. We find that the OP-exempt status itself, by affecting the price incentive, tend to induce longer work hours. The long work hours seem compensated for by slightly higher wages. Hence, our findings do not support some critics' argument that the OP exemption legalizes no compensation for overtime work. However, our results also indicate that the DWS, a legal OP-exempt status, does not necessarily result in shorter work hours, and instead, tend to reduce hourly wages, relative to the traditional (unofficial) OP-exempt status. Therefore, our findings do not support the proponents of the WCE either. We do find, however, that work hours are substantially more varied under the DWS than the SWC, even after controlling for a number of covariates that control for both observable and unobservable job/hosehold characteristics. This finding may be thought of as being consistent with the argument of the WCE proponents — workers are able to choose their own work hours freely according to their preferences/productivities. We, however, still need to be cautious in interpretting this result. First, this variability in work hours might not necessarily imply higher productivity. Second, this variability might be coming from self-selection of workers with different preferences and productivities as expected from our model. Third, variability in work hours might also imply that there are workers who work extremely long hours.

These results also signify the importance of paying attention to regulatory details of the WCE rule. In general, the WCE eligibility comprises three tests: the salary basis test, the salary level test, and the job type test. The current debate about the WCE essentially focuses on the salary level test — the new rule intends to cover all salary-based workers earning more than 10.5 million yen per year. But whether the new rule also affects the other aspects of eligibility is largely unclear. Our results signifies that it is these other aspects that really matter. That is, whether or not the exempt status comes with the flexibility and authority to manage their own work: i.e., how and when to complete the assigned tasks. Currently, the DWS requires a relatively strict process for converting a job/worker to the DWS status. That partly helps to enforce firm's compliance with the eligibility rules. If, however, the new WCE rule removes this requirement or the flexibility/authority aspect of the eligibility — all jobs/workers passing the salary level test are automatically converted to the legal OP-exempt status — then it might simply result in more of SWC-like positions: i.e., long work hours without flexibility/authority to manage their own work. Even if workers are compensated by slightly higher wages for these disamenities, it is unlikely to live up to the important premise of the WCE. Without the work arrangement that allows eligible workers to work flexibly without monitoring and with more authority as to how and when to work to complete assigned job tasks, the WCE is unlikely to increase labor productivity or innovation.

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Table 1: Distribution of Employees over Alternative Work-hour Systems by Industry, Occupation, Firm Size, and Population Density

	Overtime-pay Positions		No Overtime-pay Positions		
	Regular Hour	Flexible/Variable Hour	DWS (OP-exempt)	SWC (OP-exempt)	Total
All	13,483	4,357	729	1,259	19,828
	(68.0)	(22.0)	(3.7)	(6.4)	(100.0)
by industry					
Construction	1,163	119	20	106	1,408
	(82.6)	(8.5)	(1.4)	(7.5)	(100.0)
Manufacturing	3,744	1,869	305	431	6,349
	(59.0)	(29.4)	(4.8)	(6.8)	(100.0)
IT/Telecommunication	1,250	497	144	96	1,987
	(62.9)	(25.0)	(7.3)	(4.8)	(100.0)
Whole Trade/Retail Trade	1,450	260	37	107	1,854
	(78.2)	(14.0)	(2.0)	(5.8)	(100.0)
Finance/Insurance	784	103	55	78	1,020
	(76.9)	(10.1)	(5.4)	(7.7)	(100.0)
Real Estate	399	45	7	34	485
	(82.3)	(9.3)	(1.4)	(7.0)	(100.0)
Other	4,693	1,464	161	407	6,725
	(69.8)	(21.8)	(2.4)	(6.1)	(100.0)
by occupation					
Management/Supervisory	2,280	632	100	606	3,618
	(63.0)	(17.5)	(2.8)	(16.8)	(100.0)
Professional/Technical	3,914	1,771	329	292	6,306
	(62.1)	(28.1)	(5.2)	(4.6)	(100.0)
Clerical	4,107	815	123	144	5,189
	(79.2)	(15.7)	(2.4)	(2.8)	(100.0)
Sales	1,340	293	129	105	1,867
	(71.8)	(15.7)	(6.9)	(5.6)	(100.0)
Service	578	292	12	43	925
	(62.5)	(31.6)	(1.3)	(4.7)	(100.0)
Other	1,264	554	36	69	1,923
	(65.7)	(28.8)	(1.9)	(3.6)	(100.0)
by firm size					
1-99 employees	5,174	753	139	479	6,545
	(79.1)	(11.5)	(2.1)	(7.3)	(100.0)
100-999 employees	4,489	1,257	191	353	6,290
	(71.4)	(20.0)	(3.0)	(5.6)	(100.0)
1000 or more employees	3,820	2,347	399	427	6,993
	(54.6)	(33.6)	(5.7)	(6.1)	(100.0)
by population density					
1st Tertile	4,731	1,310	154	380	6,575
	(72.0)	(19.9)	(2.3)	(5.8)	(100.0)
2nd Tertile	4,369	1,500	245	412	6,526
	(66.95)	(22.98)	(3.75)	(6.31)	(100)
3rd Tertile	4,176	1,483	322	452	6,433
	(64.92)	(23.05)	(5.01)	(7.03)	(100)

Note: Off-site work contracts are counted toward DWS.

Figure 1: Impact of the Discretionary Work System in Rosen's model of labor market contracts

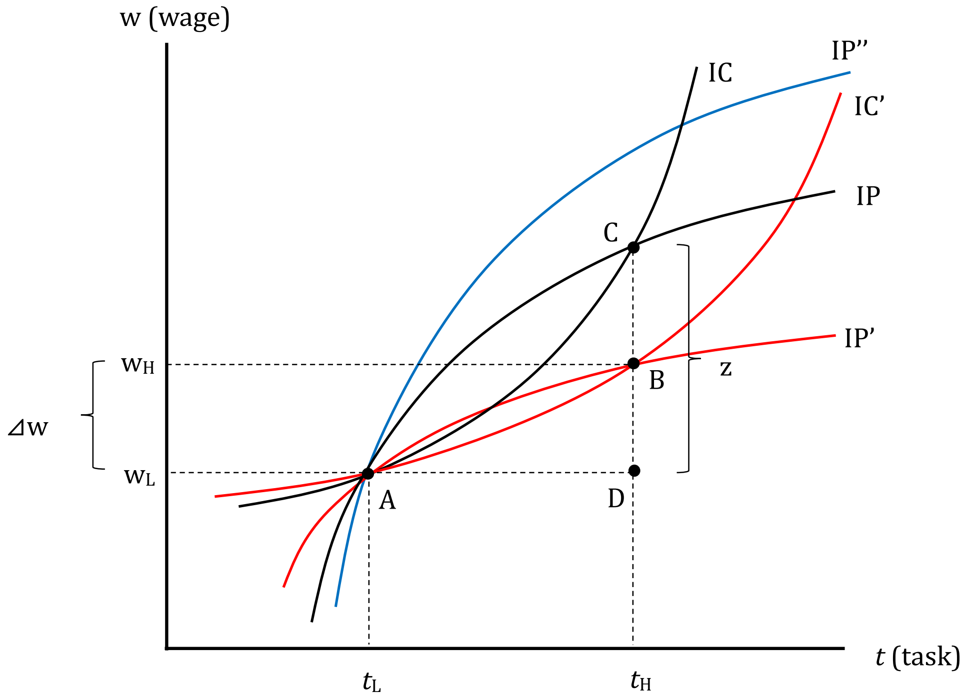

Figure 2: Weekly Work Hours by Firm Size and Population Density Tertiles
($0.2 \leq$ Propensity Score ≤ 0.4)

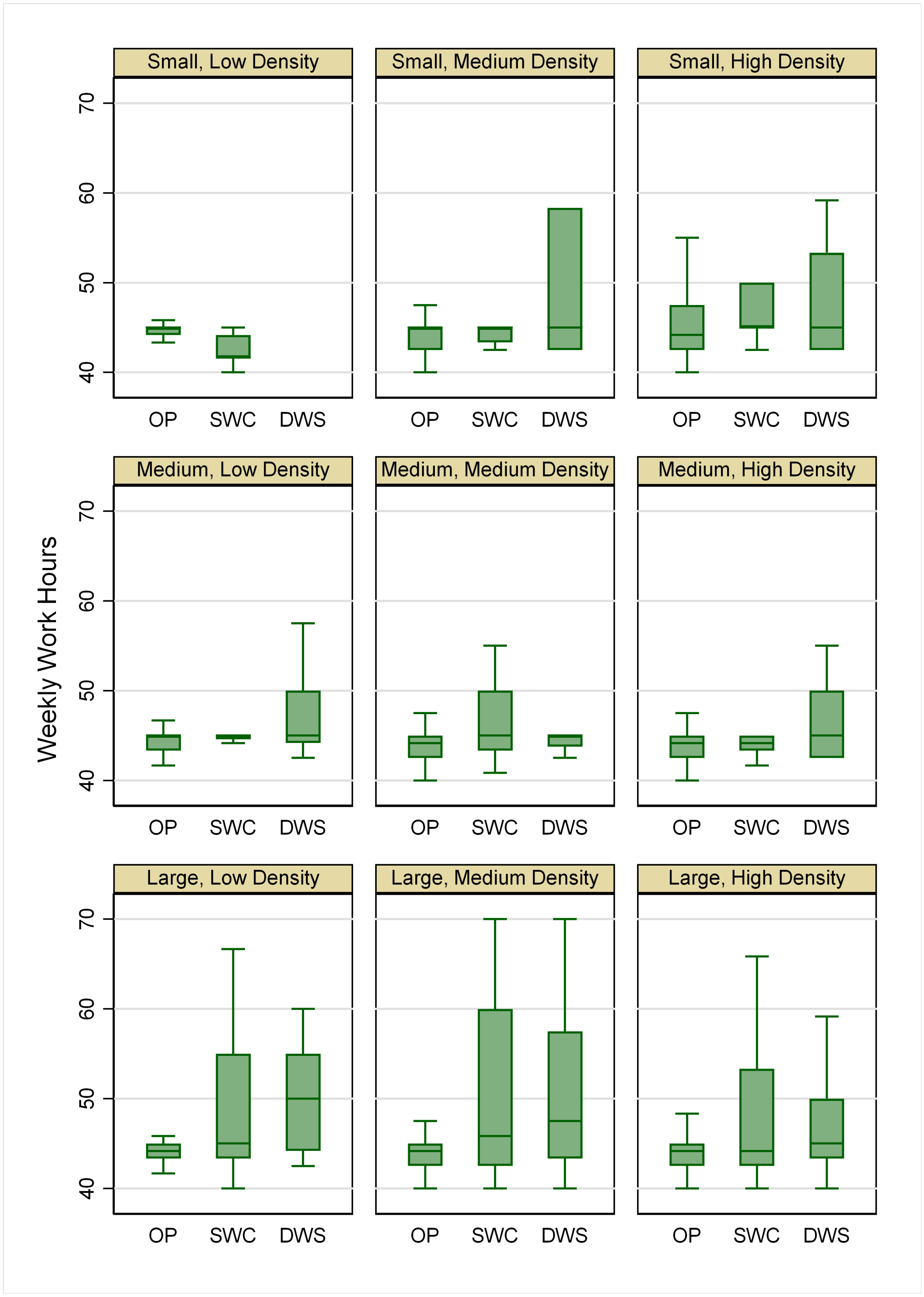

Figure 3: Logged Hourly Wages by Firm Size and Population Density Tertiles
(0.2 $\leq$ Propensity Score $\leq$ 0.4)

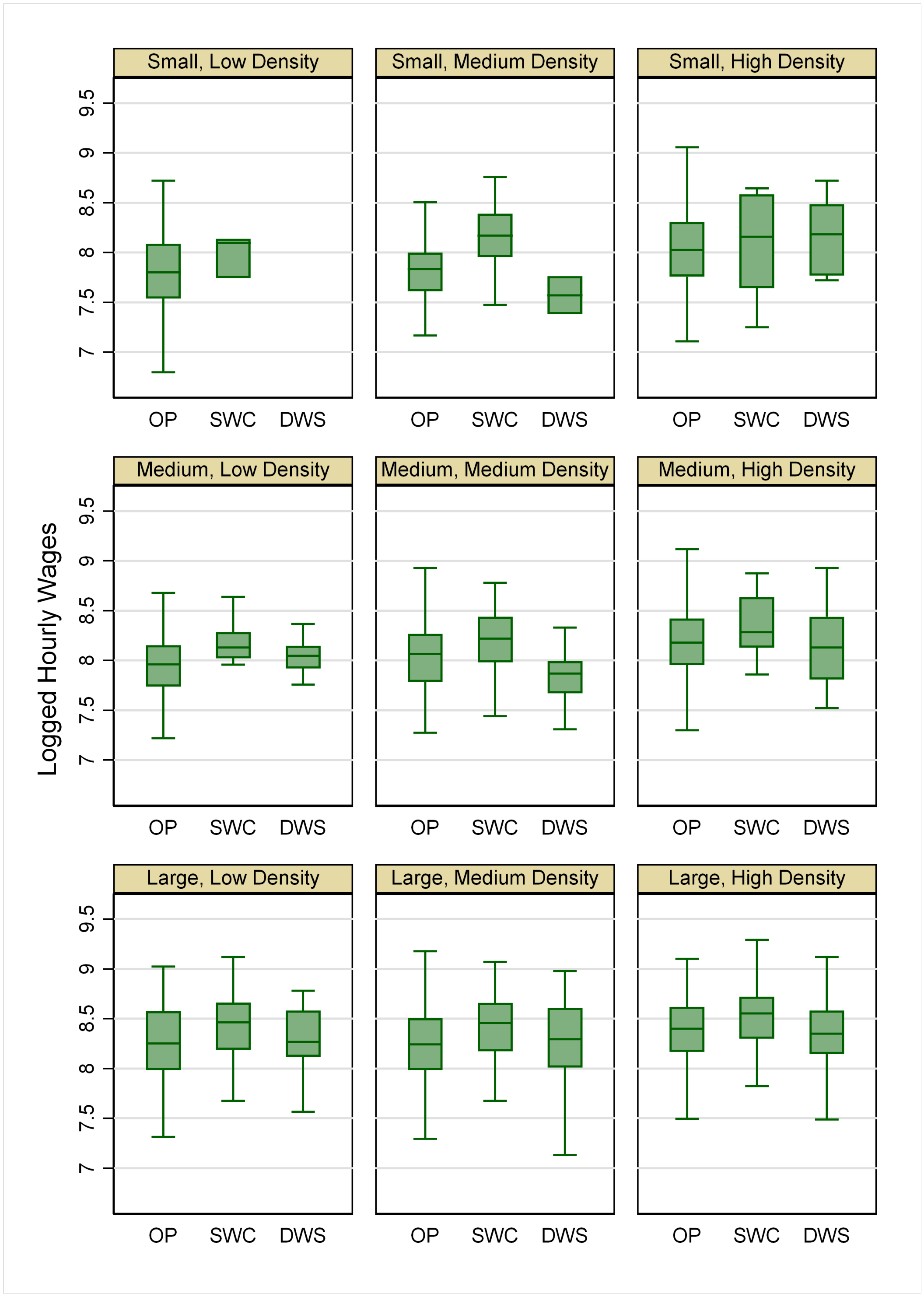

Table 2: Distribution of Work Hours in a Typical Week over Alternative Work-hour Systems by Industry, Occupation, Firm Size, and Population Density

	Overtime-pay Positions		No Overtime-pay Positions		
	Regular Hour	Flexible/Variable Hour	DWS (OP-exempt)	SWC (OP-exempt)	Total
	45.2	47.2	47.7	47.1	45.9
	(6.0)	(8.4)	(8.2)	(10.0)	(7.1)
by industry					
Construction	46.2	45.6	46.3	47.8	46.3
	(5.6)	(7.8)	(7.6)	(9.7)	(6.3)
Manufacturing	45.6	47.8	48.6	47.4	46.5
	(5.7)	(7.1)	(7.8)	(8.6)	(6.5)
IT/Telecommunication	44.7	46.1	47.1	43.8	45.2
	(5.3)	(6.5)	(6.4)	(9.3)	(6.0)
Whole Trade/Retail Trade	45.2	47.1	47.8	48.9	45.8
	(5.8)	(8.2)	(7.4)	(8.7)	(6.5)
Finance/Insurance	44.9	45.4	45.3	48.2	45.2
	(7.0)	(10.2)	(7.3)	(11.3)	(7.8)
Real Estate	44.5	44.5	46.1	45.4	44.6
	(5.1)	(5.6)	(2.9)	(10.3)	(5.7)
Other	45.0	47.2	47.8	46.9	45.6
	(6.5)	(10.3)	(10.7)	(11.4)	(8.0)
by occupation					
Management/Supervisory	44.9	46.6	47.3	47.0	45.6
	(6.1)	(6.9)	(6.2)	(8.7)	(6.8)
Professional/Technical	45.7	47.7	47.4	47.0	46.4
	(5.6)	(7.3)	(7.2)	(10.0)	(6.5)
Clerical	44.6	45.9	47.5	45.9	44.9
	(5.3)	(7.7)	(8.6)	(11.7)	(6.1)
Sales	45.7	47.4	48.8	47.7	46.3
	(6.8)	(8.7)	(9.2)	(9.9)	(7.6)
Service	45.3	46.5	38.1	47.4	45.7
	(8.0)	(9.1)	(14.1)	(12.3)	(8.7)
Other	46.2	48.6	52.1	50.0	47.1
	(7.3)	(12.5)	(11.3)	(14.3)	(9.6)
by firm size					
1-99 employees	45.4	46.3	47.9	46.7	45.7
	(6.2)	(9.4)	(8.7)	(11.5)	(7.2)
100-999 employees	45.1	46.9	47.2	46.2	45.6
	(5.8)	(7.8)	(8.8)	(9.9)	(6.7)
1000 or more employees	45.2	47.6	47.9	48.3	46.3
	(6.1)	(8.4)	(7.8)	(8.0)	(7.3)
by population density					
1st Tertile	45.5	47.6	48.8	46.9	46.1
	(5.8)	(8.8)	(9.2)	(10.2)	(7.0)
2nd Tertile	45.3	47.5	47.5	48.0	46.1
	(6.3)	(8.3)	(8.9)	(10.3)	(7.3)
3rd Tertile	44.9	46.6	47.4	46.6	45.5
	(5.9)	(7.9)	(7.2)	(9.4)	(6.8)

Note: Off-site work contracts are counted toward DWS.

Table 3: Descriptive Statistics

	Whole Sample	OP	SWC	DWS
N. of observation	7,416	6,447	563	406
(%)		(0.869)	(0.076)	(0.055)
Weekly Work Hour	45.693	45.410	47.358	47.876
	(5.959)	(5.514)	(8.267)	(7.848)
Hourly Wage (logged)	7.862	7.814	8.215	8.140
	(0.565)	(0.555)	(0.547)	(0.490)
Firm Size				
1-99 employees	0.346	0.366	0.234	0.177
100-999 employees	0.299	0.308	0.270	0.200
1000 or more employees	0.355	0.326	0.496	0.623
Population Density	5893.177	5768.207	6342.084	7255.117
	(5567.800)	(5531.335)	(5703.150)	(5752.400)
Age	47.531	47.259	50.943	47.116
	(8.531)	(8.658)	(6.656)	(7.770)
Years of School	14.947	14.849	15.458	15.791
	(1.941)	(1.945)	(1.796)	(1.745)
Female	0.150	0.165	0.043	0.062
Married	0.725	0.709	0.877	0.761
Small Children	0.220	0.222	0.179	0.246
Industry				
Construction	0.127	0.133	0.119	0.039
Manufacturing	0.420	0.404	0.517	0.532
IT/Telecommunication	0.152	0.149	0.115	0.249
Wholesale Trade/Retail Trade	0.158	0.168	0.117	0.067
Finance/Insurance	0.098	0.097	0.105	0.101
Real Estate	0.045	0.049	0.027	0.012
Occupation				
Management/Supervisory	0.199	0.178	0.494	0.136
Professional/Technical	0.342	0.340	0.263	0.485
Clerical	0.310	0.333	0.128	0.192
Sales	0.138	0.138	0.108	0.180
Service	0.011	0.011	0.007	0.007

Standard deviations in parenthese for numerical variables. For categorical variables, only shares are reported.

Table 3: Descriptive Statistics (continued)

	Whole Sample	OP	SWC	DWS
Department Size				
1-4 employees	0.255	0.265	0.222	0.150
5-9 employees	0.274	0.280	0.224	0.234
10-19 employees	0.209	0.207	0.199	0.259
20 or more employees	0.262	0.248	0.355	0.357
Job Rank				
Ordinary	0.442	0.475	0.130	0.345
Section Chief	0.404	0.388	0.513	0.517
Division Head	0.154	0.137	0.357	0.138
Number of Subordinates				
0 employee	0.430	0.448	0.199	0.458
1 employee	0.114	0.118	0.071	0.113
2-4 employees	0.203	0.203	0.217	0.185
5-9 employees	0.120	0.113	0.197	0.126
10 or more employees	0.133	0.118	0.316	0.118
Reimbursement Length				
paid by company if necessary	0.160	0.164	0.133	0.125
within 1 month	0.608	0.598	0.680	0.663
more than 1 month	0.021	0.020	0.027	0.030
no reimburse occasion	0.212	0.218	0.160	0.182
Multifaceted Personnel Evaluation System	0.243	0.231	0.298	0.355
Skill				
ability to think logically	16.894	16.678	18.053	18.712
	(10.872)	(11.043)	(9.230)	(9.961)
interpersonal skill	27.794	27.906	25.101	29.746
	(17.445)	(17.655)	(14.439)	(17.526)
leadership skill	18.489	17.975	23.798	19.283
	(12.532)	(12.518)	(12.211)	(11.421)

Standard deviations in parenthese for numerical variables. For categorical variables, only shares are reported.

Table 4: Estimation Results: Differences over Alternative Work-hour Systems

	SWC - OP	DWS - OP	DWS - SWC
Weekly Work Hours			
Stratified Matching	2.2853 ***	2.0506 ***	-0.2348
	(0.6173)	(0.4723)	(0.7472)
OLS	1.6704 ***	2.1674 ***	0.4969
	(0.3561)	(0.3883)	(0.5143)
PS Matching	0.5346	1.1688 *	0.5427
	(0.6445)	(0.7071)	(0.6800)
Logged Hourly Wage			
Stratified Matching	0.1155 ***	0.0568 **	-0.0587
	(0.0293)	(0.0271)	(0.0416)
OLS	0.0677 ***	0.1215 ***	0.0539 **
	(0.0190)	(0.0190)	(0.0256)
PS Matching	0.0268	0.0839	0.0420
	(0.0538)	(0.0613)	(0.0354)

Bootstrapped standard errors with 100 replications for the stratified matching and robust standard errors for the PS matching are in parentheses. *, **, *** indicate statistical significance at 10%, 5%, and 1% levels, respectively.

Table 5: Estimation Results : Differences over Alternative Work-hour Systems by Firm Size and Population Density Tertiles from Stratified Matching

	SWC - OP	DWS - OP	DWS - SWC
Weekly Work Hours			
overall	2.2853 ***	2.0506 ***	-0.2348
	(0.6173)	(0.4723)	(0.7472)
by firm size			
1-99 employees	3.4305 **	1.3454	-2.0851
	(1.3600)	(0.8922)	(1.7258)
100-999 employees	0.7810	2.3654 **	1.5843
	(0.7740)	(0.9912)	(1.2649)
1000 or more employees	2.6872 **	2.2809 ***	-0.4062
	(1.1238)	(0.5272)	(1.1818)
by population density			
1st Tertile	1.7587 *	2.1023 **	0.3436
	(1.0618)	(0.9716)	(1.5092)
2nd Tertile	2.6688 **	1.1289	-1.5398
	(1.3463)	(0.7084)	(1.4171)
3rd Tertile	2.3412 **	2.8513 ***	0.5100
	(0.9127)	(0.7070)	(1.1414)
Logged Hourly Wage			
overall	0.1155 ***	0.0568 **	-0.0587
	(0.0293)	(0.0271)	(0.0416)
by firm size			
1-99 employees	0.0297	0.0575	0.0278
	(0.0633)	(0.0577)	(0.0847)
100-999 employees	0.1347 ***	0.0402	-0.0945
	(0.0467)	(0.0523)	(0.0704)
1000 or more employees	0.1585 ***	0.0693 **	-0.0892 *
	(0.0419)	(0.0310)	(0.0517)
by population density			
1st Tertile	0.0960	0.0475	-0.0485
	(0.0732)	(0.0598)	(0.1003)
2nd Tertile	0.0578	0.0704	0.0126
	(0.0538)	(0.0478)	(0.0729)
3rd Tertile	0.1832 ***	0.0516 *	-0.1317 ***
	(0.0418)	(0.0312)	(0.0493)

Bootstrapped standard errors with 100 replications are in parentheses. *, **, *** indicate statistical significance at 10%, 5%, and 1% levels, respectively.

A Appendix

Figure A.1: Distribution of Weekly Work Hours