Procrastinators and hyperbolic discounters: Transition probabilities of moving from temporary into regular employment[†]

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Abstract

Temporary agency work (TAW) is believed to facilitate matching between firms and job searchers, which results in shortening the unemployment and job search duration. On the other hand, as firms hiring temporary workers have less incentive to train them, it is difficult for low-skilled temporary workers to find better jobs in the future. This study examines the effect of TAW experience on employment transitions in the Japanese labor market, focusing on individual time preferences. Investments in one's career involve a trade-off between immediate costs and future rewards, and thus individual heterogeneity in time preferences may explain the behavioral patterns of the labor force in career choices. The results indicate that those who have a higher degree of impatience are likely to engage in the TAW sector. In addition, those who have held temporary jobs are less likely to move into regular job positions, but no significant wage differences are observed between those with the TAW experience and those without the TAW experience. The observed negative effect of TAW on the transition probability into regular employment becomes smaller or statistically insignificant, when time preferences are additionally controlled for. The combined findings suggest that the possible negative effect may be attributed to the difference in the time preferences between individuals with the TAW experience and those without.

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1. Introduction

In standard economics, temporary work has been thought to enhance labor market efficiency (Autor, 2009). Agencies specifically focusing on temporary job market facilitate the matching process between firms and job seekers, and are thus believed to play a role in shortening unemployment spells, benefiting both the employers and employees. Temporary work has therefore been expected to function as a "stepping stone" toward regular employment (Guell and Petrongolo, 2007; Ichino et al., 2005; Malo and Munoz-Bullon, 2002). However, as temporary workers receive less work-related training than their counterparts in regular employment do (Booth et al., 2002), it becomes more difficult for them to find a better job in a stable position as time progresses (Autor and Houseman, 2010). Furthermore, longer temporary contracts lead to a reduction in workers' average job search intensity (Kahn, 2009), which again reduces the likelihood of moving into a regular employment status. This study investigates how the past experience in temporary agency work (TAW) affects the probability of becoming a regular employee and how it affects the hourly wage. While clarifying the causal mechanism behind the TAW experience and its effect on transition probability and earnings, we focus on the behavioral characteristics, which are measured by time preferences. We predict that the time preferences affect individual decisions to enter the TAW sector, whereby this TAW experience affects the current employment type and wages.

Some recent studies have explored the effects of time preferences on job searches, as the investments in one's career involves a trade-off between immediate costs and later rewards. For example, DellaVigna and Paserman (2005) and Paserman (2008) found that the exit rate from the unemployment status is affected by the degree of impatience, which varies based on the assumptions of exponential and hyperbolic discounting. Impatient individuals with exponential time preferences tend to lower the reservation wage, and this may increase their unemployment exit rate. On the other hand, those exhibiting hyperbolic attitudes are likely to defer job search activities; moreover, as they may not lower the level of reservation wages when they finally search for a job, they tend to experience longer periods of unemployment. Individual time preferences also explain job-to-job transitions involving internal job promotions and external job mobility (Drago, 2006). According to van Huizen (2010), hyperbolic agents are likely to procrastinate both internal and external job mobility efforts because these are investment activities involving immediate costs.

In this study, we hypothesize that time preferences affect the probability of engaging in the TAW. More specifically, we predict impatient people are more likely to enter TAW sector, because they pursue short-term rewards from temporary employment despite a potential long-term loss in their employment status and/or earnings. We then predict that those with TAW experience will be less likely to transition into regular employment, although the prior experience in TAW sector may not have an immediate negative effect on their earnings. Using propensity score matching (PSM) methods,

we attempt to investigate a more direct effect of TAW experience between those who had work experience in the TAW sector in the past two years (hereafter, TAW-experienced) and those who did not (hereafter, non-TAW) but whose observatory characteristics are similar to those of the TAW-experienced. The data is obtained from a panel survey that has been conducted in Japan since 2004 using a random sample drawn from 6,000 individuals by a placement method. We used 2009-2010 survey data for the main analysis and 2007-2008 to investigate changes in employment status before the TAW experience. TAW employees in this study are defined as those who were registered with temporary agencies for a temporary assignment from one day to three months in the past two years, and regular employees denote those who are directly hired by employers without a fixed-term contract. Transition from temporary to regular employment refers to the career progress of those who were at some point engaged in the TAW sector in 2008 and/or 2009 but became regular employees in 2010.

This study contributes to the related literature in a number of ways. First, it focuses on the effect of behavioral characteristics on the probability of entering the TAW sector, using a unique data set. Our data set contains a variety of questions concerning time preferences and other individual behavioral characteristics. Time preferences are measured by a variety of retrospective and hypothetical questions, which make it possible for us to measure both "childhood" and "present" discounting rate. The present time preferences may be inversely correlated with the probability of having TAW experience, as it is assumed that individuals would temporarily display impatient characteristics due to their experience in the TAW sector. In this case, the childhood time preferences can be a better indicator that reflects one's actual time preferences that affect the decisions pertaining to future career paths. However, this approach is not without limitations, as individual time preferences could change since childhood because of education and/or work experience. Thus, for comparison, individual time preferences using both childhood and present time discounting factors are controlled for in this study. By doing so, this study attempts to clarify the casual mechanism in relation to the individual heterogeneiety in time preferences, when estimating the effect of the TAW experience on the job transition to regular employment and the wage difference in TAW-experienced and non-TAW individuals.

Secondly, this study analyzes the Japanese labor market. In Japan, a dual labor market comprises of a sector of highly stable employment and a considerably less stable sector of part-time, temporary contract workers, which has emerged in the 1970s and has since become an important policy agenda, especially after the Lehman shock (Rebick, 2005). There has been some evidence of rigid mobility within the dual labor market, whereby starting one's career in less stable rather than regular employment reduces one's probability of attaining regular employment in the future (Ariga and Okazawa, 2011). Our data also suggests rigidity in job transitions between employment types. More

specifically, based on our findings, on average, only 7.1% of employees who were in the TAW sector moved into regular jobs over the past four years of 2008-2011 survey periods. The inter-sector mobility of male labor force is less fluid than that of females, and most part-time and temporary agency workers remain in the same sector. A few studies have empirically examined the function of temporary work toward regular employment in Japan. Notably, Okudaira et al (2013) investigated the empirical effect of temporary help service work on the probability of obtaining permanent employment or becoming unemployed in the subsequent waves of their survey, using the data from an Internet survey conducted in Japan from 2008 to 2011. Their findings suggest that temporary work may not have any "stepping stone" effect on the permanent employment. Moreover, while the probability of temporary workers becoming unemployed may be lower compared to the probability that those who were originally unemployed would remain out of work, it is statistically significantly higher than that of directly hired part-time workers, at least over the following two years. This suggests that temporary help service could benefit the temporary workers by offering some employment opportunities in the short term, but it does not yield any positive effect on the subsequent career prospects for permanent employment. In our study, we examine how individual time preferences are associated with the decision to engage in TAW employment, as well as whether the work experience in the TAW sector acts as a trap for long-term non-regular employment. Our investigation of the role of TAW experience from the perspective of time preferences can contribute to the related literature by providing further analysis of the behavioral traits of the TAW workers, which enhances the current understanding of the reasons behind the persistence of the Japanese dual labor market.

Thirdly, this study can be further analyzed in the policy context. Since the enactment of "*The Worker Dispatching Act*" in 1985 in Japan, which allows project-based employment and the dispatching of temporary workers upon request, the number of temporary workers has rapidly increased. After the Lehman shock in 2008, however, many temporary workers were laid off, and this has drawn the public attention to the issue of unstable employment status and the need for legal protection of this labor force. As a result, new rigid guidance was subsequently enacted to impose a limitation on the contract term of temporary workers who are registered with TAW agencies and dispatched to manufacturing companies.[3] The new administrative guidance on TAW employment in Japan was formulated to assist temporary workers in becoming regular employees after a certain period of work experience in the TAW sector. However, this initiative may bring the unexpected—and undesired—outcome of temporary workers simply being laid off when their contract expires and rarely moving into regular jobs. Thus, in order to better evaluate the policy implications, the effect of

[3] The contract limitation excludes the TAW employees who are classified under the 26 professional categories that require company-specific knowledge and experience. For more details about the revisions on administrative guidance, please see Okudaira et al (2013, pp. 39-40).

the TAW experience on the subsequent career outcomes before and after the policy change should be more thoroughly examined. In this regard, analysis of the TAW sector workers based on empirical evidence may clarify the employment transition dynamics of TAW employees in the Japanese labor market in the policy context.

Finally, this study employs the PSM methods to better examine the effect of TAW experience on the subsequent employment status. Those that have never engaged in TAW employment might have different baseline characteristics, which lead to gaining regular employment. Thus, to reduce this selection bias, we attempt to estimate how TWA-experienced individuals would have performed if they had never worked in the TAW sector. To identify this counterfactual effect, we substitute non-TAW individuals that have characteristics similar to those of the TAW-experienced for a counterfactual group and estimate the effect of TAW experience by comparing the TAW-experienced with the counterfactual group. It should be noted, however, that the worker's TAW employment may be driven by some other unobserved characteristics. In other words, the exposure to the TAW experience may not be random. In this article, the individual heterogeniety in time preferences is considered as one of the important unobserved individual choice characteristics that might play a significant role in determining the probability of transitioning into regular employment. By including time preferences into a set of matching variables, we attempt to find the counterfactual group with similar degree of impatience to that of the TAW-experienced. Moreover, we attempt to test whether unmeasured variables cause the odds of the TAW experience to differ or not, applying two methods that have been used to verify, albeit indirectly, the randomness of the selection into the TAW experience to assess the sensitivity of estimates (Ichino et al., 2008; Rosenbaum, 2002).

The main results indicate that time preferences affect individual decisions to enter the TAW sector. The effect of impatience on the probability of engaging in the TAW can be interpreted as indicating that impatient individuals put more weight on gaining immediate rewards from temporary employment. This TAW experience has a negative effect on the job transition to regular employment. On the other hand, when time preferences are additionally controlled for using the PSM methods, the negative effect is reduced and may even lose statistical significance. This suggests that the transition probability for TWA-experienced can be partly or substantially explained by a higher degree of impatience. In contrast to the finding that those with TAW experience are less likely to find regular employment, we could not find any significant wage differences between those with TAW experience and those without. The combined results indicate that, despite the possibility that TAW experience may deter the agents from becoming regular employees, the TAW-experienced do not seem to have significantly lower earnings compared with non-TAW at least in the short run.

The remainder of this paper is organized as follows. Section 2 introduces previous studies that present the theoretical and empirical background of the time preferences affecting job searches.

Section 3 describes the data, and is followed by Section 4, which presents the econometric frameworks to examine (i) the relationship between time preferences and the probability of engaging in the TAW sector and (ii) the probability of TAW workers moving into regular employment, as well as the differences in wages offered to the TWA-experienced and non-TAW. Section 5 reports the estimates of the Average Treatment Effect on the Treated (ATT). Section 6 presents the robustness check results and Section 7 concludes.

2. Background Literature

In standard economic models, under which agents are assumed to discount future costs and benefits exponentially, individuals with higher discount rates tend to be impatient at a constant rate.[4] DellaVigna and Paserman (2005) found impatience has two inconsistent effects on the job search effort and the reservation wage decisions. They explain that if time preferences are constant over time, the effect of the reservation wage is stronger than that of the job search, thereby leading to an increase in the unemployment exit rate. In other words, impatient individuals with exponential time preferences are more likely to accept the job offer despite low wages and to exit the unemployment. However, the effect of impatience on job search can differ if an individual has time-inconsistent preferences, which can be explained by quasi-hyperbolic discounting models (Laibson, 1997).[5] As an alternative to the standard exponential discounting model, these models consider the fact that a person may not have well-formed plans about costs and benefits and thus displays time-inconsistent preferences. Those exhibiting hyperbolic characteristics are likely to prefer a lower discounting rate for the distant future than for the near future, but face a high degree of impatience as the distant future is about to be realized. According to Paserman (2008), if agents have time-inconsistent preferences, the search effect dominates the reservation wage effect, and leading to longer periods of unemployment. In other words, hyperbolic agents, who are more sensitive to the immediate costs of an employment search, are likely to delay their job search activities, such as writing the resume or contacting employers, to a later period. Consequently, they are less likely to exit from unemployment.

The relationship between exponential/hyperbolic models and job search can be explained by two separate decisions that the unemployed workers make in their job search process (DellaVigna and

[4] The exponential discounting model can be expressed by the following inter-temporal utility function: $U^t(u_t, u_{t+1} \dots, u_T) = \sum_{k=0}^{T-t} \delta^k u_{t+k}$, where $\delta^k = (1/1+\gamma)^k$. The individual's well-being at time $t+k$ (u_{t+k}) multiplied by his/her discount function (δ^k) is further expressed by the discount rate (γ) (Paul, 1937).

[5] $U^t(u_t, u_{t+1} \dots, u_T) = u_t + \beta \sum_{k=1}^{T-t} \delta^k u_{t+k}$, where $0 < \beta < 1$. In this model, the β parameter is newly introduced; if β equals one, it is equivalent to the exponential discounting function. The implied discount factor from the current to the subsequent period is $\beta\delta$, while the discount factor in the sufficiently distant future is simply δ. In other words, the per-period discount rate between the current and the subsequent period is $(1-\beta\delta)/\beta\delta$ and the per-period discount rate between any two distant future periods is $(1-\delta)/\delta$. The former is higher than the latter, implying that agents prefer a greater reward in a sufficiently distant future than a smaller one at the moment.

Paserman, 2005). The unemployed assess the probability of receiving a job offer and chooses the amount of search effort and, once the offer is received, they need to decide whether to accept the job or wait for a better offer. The first decision involves a trade-off between the immediate costs incurred by job searches, and the delayed rewards obtained in the near future if an offer is received. Thus, in this case, short-run impatience[6] is the most influential factor. On the other hand, the second decision—made after the offer is received—involves the variation in the long-run impatience, as the worker will compare long-term consequences that will differ depending on whether he/she chooses to accept the offer or decides to wait for a better one. To examine the exit rates from unemployment in the time discounting models, DellaVigna and Paserman (2005) conduct empirical analysis based on two longitudinal data sets that include unemployment spells, job search activities, and various impatience indicators. In their study, the measures of impatience are strongly and negatively associated with the unemployment exit rate. On the other hand, no relationship between impatience and the reservation wage is found; in contrast, the reservation wage should be strongly negatively correlated with the impatience in the exponential discounting model. These findings can be interpreted in the context of their theoretical framework as indicating that their measures of impatience (such as having a bank account, using a contraceptive method, degree of smoking/alcohol consumption, etc.) capture the short-run discounting for hyperbolic individuals. Given the consistent negative effect of impatience on job search intensity, they conclude that the rationale behind a lower unemployment exit rate among hyperbolic agents is the dominating search effect over the reservation wage effect.

Paserman (2008) also argues that the effects of impatience on job search can be explained by variation of short-run discounting rate for hyperbolic agents,[7] based on the empirical results obtained from the structural estimation of the job search model. In his paper, the author identifies the short-run discounting rate using the magnitude of unemployment duration relative to the accepted wages. More specifically, for a given distribution of accepted wages, a longer duration of unemployment implies that workers tend to exhibit impatience in the short term, which reduces their search efforts. Using the medium wage sample, Paserman (2008) simulates the effects of different policy interventions and investigates which policies are more likely to increase the welfare of the hyperbolic individuals. The reported findings indicate that the policies that help with the search efforts result in enhancing the worker's long-term utility, while decreasing the duration of unemployment spells. For example, monitoring search intensity, job search assistance programs, and the re-employment bonus seem to

[6] In the $U^t(u_t, u_{t+1} \dots, u_T) = u_t + \beta \sum_{k=1}^{T-t} \delta^k u_{t+k}$, where $0 < \beta < 1$, β can be interpreted as the parameter of short-run patience and δ as the parameter of long-run patience.

[7] Paserman (2008) focused on sophisticated hyperbolic agents, who know their time inconsistency problems and attempt to find ways to overcome the procrastination problems. The short-run discounting rate indicates β parameter.

have greater effects on the unemployment exit compared to changing the duration or reducing the level of unemployment benefits.

In our study, we examine to what extent the decision to engage in TAW employment can be explained by the individual heterogeneity in time preferences. Given that individual decisions on career paths involve a trade-off between immediate costs and delayed rewards, time preferences may play a role in explaining the probability of accepting an offer from the TAW sector. While it appears that impatient individuals may engage in the TAW sector because it gives them short-term rewards (such as immediate earnings), it is also possible that their decision is motivated by the desire to avoid the immediate costs arising from dedicating more time and effort to job search activities that could lead to regular employment. Following the investigation of the association between time preferences and the individual choice of the TAW jobs, we posit that the TAW experience may result in prolonging the temporary or non-regular employment status, which makes transition to regular employment less likely. In sum, to analyze the career choices and outcomes before and after the TAW employment, two career paths are examined, namely (i) from unemployed to TAW, and (ii) from TAW to regular employment. Throughout these two career paths, we hypothesize that impatience measures positively affect the TAW experience, which in turn negatively affects the job transition to regular employment.

3. Data and measurement of time preferences

The empirical analyses in this paper are based on the data sourced from a questionnaire survey titled "Preference and Life Satisfaction Survey," conducted in Japan. This is a panel survey that was initiated in February 2004 as part of the Osaka University 21st Century Center of Excellence Program. It has been conducted annually since 2004 using a random sample drawn from 6,000 individuals by a placement method. For this study, we used the 2009-2010 data to create the dependent variable concerning job transitions and the 2007-2008 data to investigate the change in employment status before TAW experience. The responses about the TAW experience in the past two years and the hourly wages[8] are obtained from the 2010 survey data.

The sample includes regular and non-regular workers, as well as the unemployed individuals involved in job search activities. The sample includes only the individuals that were aged between 21 and 60 in 2010 (the year in which the survey was conducted) and excluded those who may choose to be in the TAW sector and/or may not attempt to move into regular employment, such as students,

[8] A self-reported hourly wage is mainly used to create a dependent variable, but for those who did not provide their hourly wage information, we calculated an hourly wage by the ratio of his/her monthly or annual income to the work hours including the paid overtime work hours.

retired persons, and housewives/househusbands.[9] In this context, regular employment (hereafter referred to as RE) denotes "direct employment, open-ended, full-time" jobs, and thus pertains to individuals that satisfy the following conditions: being directly hired by employers on a not-predetermined contract, working for scheduled hours and receiving the public insurance benefits without some exceptional cases (Asao, 2011). In contrast, those who are either indirectly employed, hired on a determined period, and/or working part-time are considered non-regular employees in this study.[10] TAW employees are defined as those who are registered with temporary agencies with the aim of obtaining temporary work assignments of the following duration: (i) one day, (ii) 2–10 days, (iii) 10 days–3 months, or (iv) more than 3 months. The TAW experience is a binary indicator of whether they engaged in the TAW sector at some point over the past two years.

Using the TAW experience as a main variable has some limitations, mainly because it is impossible to discern their career progression before and after their work experience in the TAW sector during the 2008 - 2010 survey periods. Despite the complexity and some ambiguity of career progression, using the TAW experience as a main variable also has some advantages. The percentage of dispatched workers among the employed in 2010 was on average 1.72% (9.6 million out of 547.8 million) (Statistics Bureau, 2012), and this low percentage is reflected in the dataset used for this study—only 1.07% of the labor force (42 out of 3,938) in the data is reported as TAW workers. With this small number of observations, examining the effect of TAW on the probability of moving into regular jobs, when all other factors are controlled for, is not possible. Moreover, since TAW workers are hired on short-term contracts and their job turnovers are high, those whose contracts expired around the time of the survey are not included into the samples who have the work experience in the TAW sector. If we only consider the respondents who are in the TAW sector at the time of the survey as the TAW-experienced, we may over- or under-estimate the results. Including those with previous experience in TAW sector may help to better examine the effect of the TAW employment on the subsequent career outcomes. This, in turn, enables us to reveal the possible link between TAW work and the subsequent career progression and the earnings, which would otherwise have become difficult to examine because of the limited sample size.

Our hypothesis is that the tendency for impatience is related to individual decision to engage in the TAW sector and this TAW experience result in long periods of non-regular employment. Although it is not possible to find the accurate career progression before and after the TAW experience, we

[9] With or without the samples of housewives/househusbands, on the other hand, the estimation results do not significantly differ.

[10] The definition is based on the common perception in Japan, as no legal definition exists (Asao, 2011). Regular employees are those who declare themselves "regular (*seiki* in Japanese)", while non-regular employees are those that declared themselves as "albeit/occational employee (*arubaito)*", "part-time employee (*part)*", "contract employee (*keiyaku-shain)*", or "entrusted employee (*itaku)*" in the survey.

attempted to establish the employment type of the TAW-experienced before they were engaged in the TAW in 2008-2009. Our findings based on 2007-2008 data indicate that, despite a very small sample size, most of the included individuals could be classified as either the unemployed and TAW workers.[11] This enables us to examine the decision of the unemployed to enter the TAW sector from the perspective of time preferences. Furthermore, to examine the transition probability of moving into regular employment in 2010, we only included the data provided by the respondents that were not regular employees in 2009.[12] By analyzing the difference between the unemployed/non-regular workers with and without the TAW experience, we can investigate the effect of the prior work experience in the TAW sector on the transition probability into regular employment. More specifically, the dependent variable, "transition to regular employment", equals one if they moved from unemployment/non-regular employment in 2009 to regular employment in 2010 and zero if they remained as the unemployed/non-regular employees for two consecutive years.

We created two types of individual time preferences. To measure the discount rate "during childhood," the respondents were asked "When did you work on your summer vacation homework?" They were required to provide their answers on a scale that ranges from 1 corresponding to "the beginning of the vacation" to 5 indicating "the end of the vacation". Thus, agents who answered 1 can be interpreted to have a preference for future rewards over the immediate costs of finishing the assignment and are thus less likely to procrastinate their homework during childhood. In contrast, agents who answered 5 are interpreted to have a tendency to avoid allocating more effort in order to finish the assignment early.

Proxies for the "present" time discounting are implemented using the responses to the hypothetical question, described as follows: "Let us assume that you are required to spend time cleaning a park. You need to spend two hours today, as well as next week. It seems that the litter in the park will decrease more than expected, so you will need to spend less hours on cleaning overall. To account for this change, you have the option to shorten the cleaning period by one hour today or by some specified amount of hours in 7 days. Compare the hours and timing in Option A with Option B

[11] Considering the rigid Japanese labor market, where transition to other employment types is rare, the potential for on-the-job transition to TAW employment is very small (from regular to TAW is on average 0.2%; from non-regular to TAW 1.3% over four years in our sample). To more clearly analyze behavioral patterns of job searches in relation to unemployment exit rate, we should only include in the sample those who were unemployed prior to entering the TAW sector. Unfortunately, the restricted sample is too small to conduct an empirical analysis. Based on the analysis of the restricted samples, TAW experience is founded to be negatively correlated with the probability of being RE.

[12] A binary indicator of the TAW experience indicates whether respondents were engaged in the TAW at some point over the past two years at the time of survey year 2010 (meaning, 2008 and/or 2009). Considering the possibility that the respondents became regular workers in 2009 after the TAW experience in 2008, we included those who were regular workers in 2009 and 2010 if they were either non-regular or unemployed in 2008 (when their employment status in 2008 was not identified, we restricted to the samples whose years of work experience in the current workplace is less than two years).

and indicate for each row which option you prefer." The respondents were asked to choose between two options concerning inter-temporal choices. A single choice between two inter-temporal options only reveals an upper or lower bound on the discount rate. To identify the discount rate more precisely, respondents were presented with a series of choices that varied the hypothetical rewards over seven days. There were eight series of two choices (Option A-shortening the cleaning time today, Option B-shortening the cleaning time in 7 days): (1 hour, 50 minutes), (1 hour, 1 hour), (1 hour, 1 hour 5 minutes), (1 hour, 1 hour 10 minutes), (1 hour, 1 hour 15 minutes), (1 hour, 1 hour 20 minutes), (1 hour, 1 hour 30 minutes), and (1 hour, 2 hours).

Option A of the first series (1 hour) means that the time is shortened by 1 hour today, but no time reduction is allowed in 7 days, whereas Option B (50 minutes) means that the time is shortened by 50 minutes in 7 days, but no time reduction is permitted today. More specifically, if a respondent chooses Option A of the first series, he/she is supposed to clean for 1 hour today and 2 hours a week later. It is assumed that all the respondents would choose an option that they believed would provide more favorable conditions. For instance, many respondents were expected to choose Option A at the beginning because the total cleaning time is shorter than that in Option B. However, they were expected to switch to Option B, once the comparison between the two options would make it, in their view, more favorable. Their decision to change to Option B would depend on their time discounting rate.[13] To investigate a tendency for time-inconsistent preferences, we used the same question with distant future inter-temporal choices (shortening the cleaning time in 90 days versus in 97 days). The hyperbolic agents who have time-inconsistent preferences doubt that their preferences will change over time and eliminate an option that seems inferior now but might attract them later.

4. Econometric Frameworks

To investigate the effect of TAW experience on the probability of becoming RE, we estimate how the TAW-experienced would have performed if they never worked in the TAW sector. For that purpose, the non-TAW that have similar characteristics are substituted for the counterfactual group (Rosenbaum and Rubin, 1983). Those who have never experienced working as TAW employee might have the different baseline characteristics that lead to regular employment. This method is employed to reduce this selection bias by directly comparing between the TAW-experienced and non-TAW with similar observed characteristics. In particular, we focus on individual heterogeneity in behavioral characteristics and their effect on individual decision to enter the TAW sector. Thus, we compare

[13] From each question, the discount rate of each row (γ) was first computed: $t_A = (1/1+\gamma)\, t_B$, where $t_{A(B)}$ is the length of the shortened time of option A (B). Next, the discount rate of an individual is computed by estimating a log-normal distribution for the discount rate's log (1+γ) of options (Kimball et al., 2008). For example, if the respondent selects Option A for the 3rd combination and switches to Option B in the 4th combination, then log (1+γ) is computed from a log-normal distribution of the discount rate of the 3rd and 4th rows.

TAW-experienced and non-TAW individuals with similar characteristics with respect to time preferences, to determine the more direct effect of TAW experience on the transition probability.

In case of a binary treatment, the treatment indicator T equals one if individual i is TAW-experienced and zero otherwise, and X is the multidimensional vector of pre-treatment characteristics. Those becoming RE in the survey year 2010 is defined as $Y_i(T_i)$ for each individual i, where $i = 1, \cdots, n$. It is a binary indicator that equals one if the individual i was unemployed or a non-regular worker in 2009 but became regular worker in 2010. Similarly, it is set to zero if the person remained in unemployment/non-regular employment during the entire 2009-10 survey periods. This allows us to investigate the effect of the TAW experience in 2008 and/or 2009 on the subsequent employment status in 2010. The average treatment effect of an individual i can be estimated as follows: $\mathrm{E}[Y_i(1) - Y_i(0) | T_i = 1] = \mathrm{E}[E(Y_i(1) - Y_i(0) | T_i = 1, \mathrm{p(X)}] = E(E[Y_i(1) | T_i = 1, \mathrm{p(X)}]) - E(E[Y_i(0) | T_i = 1, \mathrm{p(X)}])$. In a set of observable covariates X, socio-economic variables, such as educational attainment and the household income, financial/real assets, housing loans and other debts are included. In addition, to control for a wide set of background characteristics, age, marital status, number of children and gender are included into the model. To examine the effects of the variation in the childhood and present time preference on transition probability and earnings, we include the two measures of impatience separately into the model that incorporates individual characteristics. To better examine the effect of time preferences, we estimate three models separately: (i) without any variables, (ii) with demographic variables, and (iii) with time preferences in addition to demographic variables. In the (iii) model, we attempt to examine the difference in the effect of individual time preferences on the transition probability and earnings between TAW-experienced and non-TAW who are similar in individual characteristics. The potential outcome of non-TAW, $(\mathrm{E}[Y_i(0) | T_i = 1])$, is not observed. What is actually observed is $E[Y_i(0) | T_i = 0]$. However, we find proper substitutes for this counterfactual group, comprising of individuals with characteristics similar to those with the TAW experience. These individuals are found based on the probability of taking treatment given a vector of observed variables. The PSM approach is used to construct this unobserved or counterfactual group. To validate the PSM methods, the following two assumptions should be satisfied.

First, given a set of observable covariates X that are not affected by the treatment, the outcomes Y_i^C of the control group should be independent of the treatment assignment T (refered to as "unconfoundedness"): $\mathrm{Y}_i^C \perp T_i \mid \mathrm{X}_i$. For a given propensity score, exposure to treatment—work experience as TAW employees over the past two years—should be random. Therefore, the treatment and the control groups differ only in their error term, which is approximately independent of X. The probability of transition to regular employment of the control group should not influence the choice of the individual to engage in the TAW sector over the past two years. A second condition—called "common support"—ensures that there is a sufficiently large number of observations in the overlapped

region of propensity score distribution: $\mathrm{P}(T_i = 1|X_i) < 1$. In other words, the substantial region of the propensity score distribution should overlap between those who have two years of experience of TAW employment and those who do not. The overlap condition for individuals with the same *x* values in *X* are allowed to have a positive probability with respect to being in the treatment and control groups.

When the two assumptions hold, the balancing hypothesis that observations with the same propensity score must have the same distribution of (un)observable characteristics independently of treatment status is tested. The test is repeated until the means of each characteristic are equal for treatment and control units in all intervals of the propensity score. If the means of one or more characteristics are unequal, the balancing properties are unsatisfied[14] and a better parsimonious specification of the covariates is required. If treatment and control groups with the same propensity score are identically distributed, the ATT model is established using the PSM estimator $\tau_{ATT}^{PSM} = E\left[Y_i^T \middle| T_i = 1, P(X)\right] - \mathrm{E}[Y_i^C | T_i = 1, P(X)]$. We used a stratified nearest-neighbor matching algorithm that matches the treatment and control cases on the closest propensity score.[15] This approach identifies matched groups that are closest to the treatment group in terms of the propensity score.[16]

It should be noted, however, that that our data may not satisfy the randomness of the exposure to treatment. As explained above, the selection into the treatment should be random to satisfy the first assumption of *unconfoundedness*. We carefully selected the pre-treatment observable covariates in order to ascertain that the selection bias stemming from the different baseline characteristics between TAW-experienced and non-TAW is reduced. In particular, to capture unobserved individual choice characteristics, we included childhood and present time preferences into the set of observed characteristics. However, the worker's TAW employment may be driven by other unobserved characteristics, such as differences in (endogenously determined) effects of the demand side of the employment, individual preferences for leisure, or unobserved behavioral factors that could increase or decrease the probability of engaging in the TAW sector. Thus, in order to avoid any bias arising from the violation of the *unconfoundedness*, we first attempt to exclude those who may intentionally choose

[14] The balancing properties are satisfied with the specification of the given covariates throughout all estimations.

[15] The nearest neighbor matching set is $\mathrm{C(i)} = min_j \parallel p_i - p_j \parallel$, where $\mathrm{C(i)}$ denotes the set of control units matched to the treated unit *i* with an estimated value of the propensity score of p_i. More explicitly, with cross-section data and within the common support, the treatment effect can be written as follows (see Heckman et al., 1997; Smith and Todd, 2005): $\tau_{\mathrm{PSM}} = \frac{1}{\mathrm{N_T}}\sum_{\mathrm{i}\in\mathrm{T}}[\mathrm{Y_i^T} - \sum_{\mathrm{j}\in\mathrm{C(i)}}\omega_{ij}\mathrm{Y_j^C}] = \frac{1}{\mathrm{N_T}}\left[\sum_{\mathrm{i}\in\mathrm{T}}\mathrm{Y_i^T} - \sum_{\mathrm{i}\in\mathrm{T}}\sum_{\mathrm{j}\in\mathrm{C(i)}}\omega_{ij}\mathrm{Y_j^C}\right] = \frac{1}{\mathrm{N_T}}\sum_{\mathrm{i}\in\mathrm{T}}\mathrm{Y_i^T} - \frac{1}{\mathrm{N_T}}\sum_{\mathrm{j}\in\mathrm{C(i)}}\omega_j\mathrm{Y_j^C}$, where $\mathrm{N_T}$ is the number of participants *i* and ω_{ij} is the weight used to aggregate outcomes for the matched nonparticipants j: $\omega_{ij} = 1/N_i^C$ if $j \in \mathrm{C(i)}$ and $\omega_{ij} = 0$ otherwise.

[16] The choice of matching estimators largely depends on the data structure (Zhao, 2000) and the matching algorithm should be carefully chosen, in particular when working with small samples (Heckman et al. 1997) considering trade-off between bias and variance. For more precision in estimates, we also checked the results obtained by applying different matching algorithm, but since their findings were fairly consistent in terms of their support of our predictions and conclusions, in this paper, we only focus on the results of the nearest-neighbor matching algorithm.

the TAW employment for some unobserved reasons (e.g., better work-life balance)—such as students, the retired, and housewives/househusbands—despite the possibility of the unstable status and lower wages associated with this type of work. Even after excluding individuals that may voluntarily choose employment in the TAW sector, we need to consider the possibility that some individuals, women and older cohorts approaching retirement age in particular, may have fewer opportunities or incentives to move into the primary sector. To control for the effect of gender and age differences on the transition probability, we examine the effect of TAW employment with the sample grouped by sex, as well as stratified by different age ranges. Lastly, we examine the sensitivity of our estimated results by investigating whether the unobserved characteristics induce the violation of the *unconfoundedness*. This process is described in more detail in Section 6.

5. Estimation results

5.1. The effect of time preferences on the TAW employment

As shown in Table 1, 15.5% of the study sample has ever held temporary work in 2010. 21.5% of the individuals included in the sample became hired as regular employees in 2010, thus changing the unemployed/non-regular status they had in 2009; of those, 8.1% indicated that they had experience working as temporary workers over the past two years. Compared with the government statistics about temporary workers, the composition of educational attainment in our data is similar to that in the survey conducted by the Japanese Ministry of Economy, Trade, and Industry (METI). However, the age distribution is somewhat different, as our sample includes a smaller proportion of those aged 25-29 and a much higher proportion of those aged 50-59 (see Okudaira et al (2013, p 45) for a summary of the government statistics). Furthermore, in our study, the ratio of male workers is relatively low. To avoid introducing further bias due to the difference in the sample composition, the analyses are performed after restricting the sample by age group and gender. However, it should be noted that the small sample size may not yield consistent estimation results.

Table 2 shows average individual characteristics and time preference variables between TWA-experienced (treated) and non-TAW with similar characteristics (matched), chosen from a whole sample of non-TAW (all controls). The observable characteristics of the treatment and the control group, which are balanced based on the observed variables, are comparatively similar; in other words, the differences between the treatment and the matched control groups are smaller compared to those found between the treatment and the entire control group. Although the similarity between the treatment group and the matched controls is not observed in every single variable, the statistics suggest that people who are more similar to those in the treatment group are chosen from the entire control group to be into the matched control group. This enables us to compare two groups with similar

characteristics more directly to examine the effect of TAW experience on transition probability and earnings.

Time preference variables indicate that individuals with TAW experience have a higher time discount rate (e.g., present time preference: treated = 0.293; matched controls =0.188). This suggests that TAW employees are likely to be procrastinators. In addition, those with TAW experience have a higher time discounting rate about near future choice sets (today vs. in 7 days: 0.293) than the distant future choice sets (in 90 days vs. in 97 days: 0.272).[17] This indicates that TAW-experienced individuals may display time-inconsistent preferences. If the measures of impatience capture the hyperbolic discounting, it indicates that TAW-experienced may tend to avoid immediate costs to obtain short-term rewards, but seem to think that they will have different time preferences in the distant future. As a result, they typically favor long-term rewards in the distant future choice sets, but will face a higher degree of impatience when the distant future is about to be realized.

First, we conduct the logit regression with both TAW experience and time preferences as explanatory variables (Table 3). The first two columns present the results pertaining to the effect of TAW experience on transition probability, which indicate that the TWA experience has a significant negative effect on the probability of becoming RE. This implies that those who have ever engaged in TAW sector are less likely to move into regular employment. In contrast, neither childhood nor present time preferences have statistically significant effects on the current employment type. We predict that, although time preferences seem to have no effects on the current employment type, they do play a role at the time of the individual's decision to enter the TAW sector, because the individual decision on job searchs and career choices is likely to be made after considering immediate rewards and delayed future benefits. Thus, we predict that if we better control for the time preferences by directly comparing two groups with a simialr degree of impatience, the observed negative effect of the TAW experience may not be statistically significant.

As shown in Table 2, the control group that has more similar observatory characteristics is found as the counterfactual group in comparison with the TAW-experienced. By comparing the treatment group to control group with similar characteristics, it is then investigated whether those who have ever held temporary work move into regular jobs, and whether the earnings of individuals who have work experience in the TAW sector are statistically different from those who do not, when all observatory variables are held constant. To examine a more direct effect of TAW experience with control for

[17] The mean difference between near and distant future inter-temporal choices are 0.017 for TAW-experienced (*t* statistic = 1.541) and −0.010 for non-TAW (*t* statistics=−1.981). The difference in hyperbolic attitudes in descriptive statistics indicates the marginal statistical significance. However, the measures of impatience, when everything else held constant, have positive significant effects on the probability of engaging in TAW sector and moreover, they seem to have a significant explanatory power to identify the difference in the transition probability between TAW-experienced and non-TAW. In Section 5.3, how these measure of impatience can be interpreted in exponential and hyperbolic discounting models is explained.

individual hetergeniety in time preferences between TAW-experienced and non-TAW who are similar in other individual charateristics, the propensity score was predicted from a logistic regression of TAW employment on time preferences in addition to individual characteristics, such as income, age, assets, marital status, number of children, gender, and educational backgrounds. The results with childhood time preferences as control are presented in column (3) and those given in column (4) are based on the present time preferences. In both cases, time preferences play a significant role in identifying the behavior of individuals who have been in the TAW sector in comparison to non-TAW, ceteris paribus. These results suggest that those that prefer avoiding immediate pay, despite potential long-term loss that could lead to non-regular and temporary types of employment, have a high probability of working in the TAW sector. One possible reason for the individual decisions to enter the TAW sector from the time preference perspective is that, owing to the short unemployment benefit duration ranging from three to five months in Japan, those who are impatient and in favor of short-term benefits such as immediate earnings might tend to choose to be engaged in the TAW sector.

In addition to the discount parameters, Table 3 presents the effects of other observed personal characteristics of the respondents. The findings indicate that women, unmarried and younger individuals were more likely to be in the TAW sector during the investigated period. A desire for better work-life balance for females and less work experience for the young may be the reason to engage in the non-regular sector at least for the time being. Using the PSM methods, we have identified the group that has similar observatory characteristics, whereby the treamtent and the control group members are approximately balanced on the variables predicting the propensity score.[18] The density distributions of the propensity scores are presented in Appendix 1. The light gray bar of the graph shows the propensity score distribution for the treated (TAW-experienced), while the dark gray bar refers to the non-treated individuals (non-TAW). The figures present the existence of a substantially overlapped propensity distribution between the treatment group and the matched control groups. This finding appears to verify the second assumption that there should be sufficiently large observations in the overlapped region of propensity score distribution.

5.2. The effects of TAW experience on the transition probability and hourly wage

After finding the control groups that are distributed identically based on propensity scores using the PSM method, the mean difference in probability of being RE across the TAW-experienced and non-TAW whose observed characteristics are similar to those of the TAW-experienced is then calculated. The effects of TAW employment on the probability of transition to regular employment,

[18] X includes only the observed personal characteristics of the workers. If other (unobserved) significant factors affect selection into treatment, the estimated results might suffer from the selection problem. To investigate whether or not the assumption of *unconfoundedness* is violated, we tested the sensitivity of estimates in Section 6.

after controlling for childhood time preferences, are summarized in Table 4-A. Row (1) shows a base model that includes no observatory characteristics when predicting the propensity score and further estimating the ATT. Row (2) presents the results obtained when only demographic variables are controlled for. The results presented in these two rows indicate that the experience in the TAW sector has a significant negative effect on the probability of moving into regular employment. In contrast, when we include the childhood time preference into the model, the negative effect becomes smaller, although it is still statistically significant. The magnitude of the ATT estimate implies that the TAW-experienced has a 12.4% lower probability of moving into the regular employment.

Table 4-B summarizes the results obtained when the present time preferences are controlled for. In contrast to Table 4-A, row (3) of Table 4-B indicates that the negative effect of TAW experience on the job transition loses the statistical significance and the effect size is almost half (5.5%). However, what should be noted here is that the effect size of row (1) in Table 4-B is smaller than that of row (1) in Table 4-A, even though in both models no confounding variables are controlled for. It may be because of the complexity and length of the survey question about present time preferences. As for the present time preferences, the respondents were required to choose a long series of inter-temporal options in both near and distant future settings. Those with a relatively high degree of impatience might have skipped answering the questions or have improperly responded. This may explain why the sample size available for the analysis of present time preference is smaller than that of childhood time preference. If respondents who tend to be more impatient were dropped from the samples because of their inconsistent or missing responses, the effect of TAW experience, which is positively associated with the degree of impatience, can be mitigated.

As mentioned above, the differences in other estimated results between childhood (Table 4-A) and present time preferences (Table 4-B) might stem from the different size of samples used for each analysis. Thus, in Table-C, we present the estimated results obtained from samples of the same size—restricted to those who provided answers to both questions regarding childhood and present time preferences.[19] Overall results are similar to those summarized in Table 4-A and 4-B. While the TAW experience seems to have a negative effect on transition probability, the negative effect becomes smaller and statistically insignificant when time preferences are additionally controlled for. The results of row (3) in Table 4-C suggests that, if we compare TAW-experienced with non-TAW who have similar observed characteristics and "time preferences", TAW experience does not have an explanatory power for the job transition into regular employment. In other words, if these two groups, who are similar in individual characteristics, have additionally the same time preferences, whether they have the TAW experience or not has no statistically significant effect on the job transition. This

[19] To reduce the bias that may arise from the difference in the number of responses regarding the present time preferences, we restricted to those who provided answers to both near future (today vs. in 7 days) and distant future (in 90 days vs. in 97 days) inter-temporal choices.

suggests that the negative effects of the TAW experience on future regular employment prospects are not necessarily due to the TAW experience itself. It is rather because the TAW-experienced have a higher discounting rate than non-TAW. It means that the difference in the transition probability may be attributed to the difference in time preferences between TAW-experienced and non-TAW.

In addition to our investigation of the relationship between the TAW experience and the probability of becoming RE, we also estimate how the TAW employment affects hourly wages with the same estimation framework as the transition probability (as shown in Table 4-A and 4-B). Table 5-A and 5-B show that TAW employment seems to have a negative but insignificant effect on the hourly wage; in other words, no difference in the hourly wage in 2010 between TWA-experienced and non-TWA is observed. The TAW experience may deter the agents from becoming regular employees, but it does not necessarily mean that the wages of TAW-experienced are significantly lower than non-TAW. It is possible that project-based workers or seasonal workers hired on a contingency basis do not earn less than other types of employees for the time being. Nonetheless, in the long term, their wages may decline in comparison to their counterparts because unstable employment status may cause the wage gap to widen.[20]

This research interest lies in those who are involuntarily in the TAW sector but have attempted to move to regular jobs. In this context, one has to consider the presence of individuals, who select the TAW employment type for a better work-life balance or for some other unobserved reasons, even if they know it could lead to the unstable status and lower wages. For that purpose, we examine the effect of TAW employment using the sample grouped by sex and by age range (aged less than the median age). When using the restricted samples, all confounding variables, such as individual backgrounds and time preferences are controlled for. The results based on the childhood time preferences are presented in the lower panel of Table 4-A (rows (4) to (6)). The results suggest that regardless of gender, being in the TAW sector may decrease an individual's probability of being in regular employment. The effect size of the TAW experience is greater for the male workers, which suggests that the TAW experience may affect more negatively the transition probability of the male workers. The negative effect is also found in young cohort aged less than the median age. As presented in lower panel of Table 4-B (rows (4) to (6)), the negative effects of TAW experience on job transition applies to both males and females and young cohort, but the effects lose statistical significance when present time preferences are additionally controlled for; which is also observed in

[20] The average hourly wages of RE and TAW workers who maintained their employment type for more than five years in our data set are 1874.8 yen and 1279.7 yen, respectively. The difference in hourly wage between RE and TAW workers is statistically significant and suggests that the wage may widen in the long term, although our estimation results indicate that there is no significant difference in the wages between the TAW-experienced and non-TAW in the short term.

the main analysis of row (3) of Table 4-B. One should be cautious, however, in drawing precise conclusions because these results are based on the small size of samples.

5.3. Implications

We examined the relationship between the time preferences and the unemployment exit rate and career choices. In addition, we attempted to identify the effect of the TAW experience on the probability of moving into regular employment, comparing the unemployed/non-regular workers who have ever engaged in the TAW sector to those who have no TAW experience. First, we found that time preferences play a significant role in identifying the behavior of individuals who decided to engage in the TAW sector at some point in the past two years. Next, the baseline ATT estimates reveal that the probability of moving into regular employment is lower for those with TAW experience; however, the negative effect becomes small or statistically insignificant when time preferences are additionally controlled for.

The significant association between time preferences and the probability of choosing TAW work suggests that the unemployed with the tendency for impatience are highly likely to enter the TAW sector. One possible interpretation for this finding is that impatient individuals may prefer short-term rewards temporary work provides, such as immediate earnings, despite a greater potential for long-term losses associated with a lower probability of finding a regular job due to less work-related training. DellaVigna and Paserman (2005) explain the correlation between impatience and the probability of accepting a job offer in the exponential model, suggesting that impatient individuals lower their reservation wage and become more likely to accept the job offer. If their theoretical evidence in the exponential discounting model is applied to our results, the measures of impatience in our study may capture the exponential discounting rate and explains a higher unemployment exit rate based on the dominant effect of lowering reservation wage.

If impatient individuals are shown to be more likely to engage in some types of work, even under temporary employment contract, this may suggest that impatience measures are positively related to the unemployment exit. However, it cannot be inferred that they completely exit the unemployment or non-regular employment status. Our ATT results indicate that the TAW experience results in a less smooth transition to regular employment and longer periods of non-regular employment, compared to other non-regular workers with no experience in the TAW sector. Okudaira et al (2013) found that, in comparison to directly hired part-time workers, temporary workers have a higher probability of becoming unemployed in the subsequent waves of their survey. Based on these findings, it appears that the TAW employment does not equate to termination of one's unemployment status. Thus, if we could consider the TAW employment as an extension of unemployment status, the lower exit rate from unemployment and/or non-regular to regular employment can be viewed as an indicator that such

individuals tend to postpone job search activities and keep the reservation wage rate constant when they finally find a job (Paserman, 2008).

As mentioned above, the time preferences in association with job search activities and/or reservation wage may explain why impatient individuals included in our sample are likely to engage in the TAW sector but are less likely to attain regular employment status. However, accurate information on the respondents' career progression before and after the TAW experience, the reservation wage, the probability of receiving a job offer, and/or the job search intensity is not included in the data set used for our analyses. Moreover, because of the small sample size, it is difficult to estimate the transition probability by restricting the sample to individuals whose detailed information on the career paths over the 2008-2010 periods is available. Therefore, from a theoretical perspective, there is a limitation to clarify how the transition from unemployment to the TAW employment, and finally to the regular employment could be separately explained by time preferences and job searches expressed through varying exponential and hyperbolic discounting. However, our results suggest the possible link between lowering the reservation wage and/or deferring job search activities, and the transition from the unemployed/TAW to the regular employment, which may shed light on a casual mechanism behind the behavioral traits of people in determining the career choices.

6. Robustness Check

The ability to identify the ATT using the nearest neighbor matching algorithm is largely dependent on the validity of the *unconfoundedness* ("selection on observables"). *Unconfoundedness* is generally established when variables that need to be adjusted for are well controlled for, so that treatment assignment is essentially randomized, conditional on a set of covariates X. This condition fails to be satisfied if X includes variables that are themselves affected by the treatment, and if two agents with the same values for observed characteristics make different treatment choices, driven by unobserved characteristics. Unfortunately, we cannot directly test the condition of *unconfoundedness*, while in some cases there are ways to assess the sensitivity of estimates. In this section, two methods, albeit indirect, are used to test whether the *unconfoundedness* maintains or not.

First, as proposed by Ichino et al. (2008), the sensitivity of ATT matching estimates is examined. The distribution of the unobserved binary confound factor U (here, U is considered as any other observed characteristics in the multidimensional vector of pre-treatment characteristics, W) is characterized by specifying the parameters: $\Pr(U = 1|T = i, Y = j, W) = \Pr(U = 1|T = i, Y = j) \equiv p_{ij}$ with $i, j = \{0,1\}$, which give the probability that $U = 1$ in each of the four groups defined by the treatment status and the outcome value. Once these four probabilities are imposed, the following can be computed: $p_i = \Pr(U = 1|T = i) = \sum_{j=0}^{1} p_{ij} \cdot \Pr(Y = j|T = i)$. Based on the values of these parameters, a value of the confounding factor for each treatment and control group is predicted and the

ATT, including the simulated *U* in the set of matching variables, is re-estimated by applying the nearest neighbor propensity score matching. The results are presented in Table 6, whereby each row of the first four columns contains the four probabilities and the following two columns characterize the distribution of *U* only by treatment status.[21]

The last four columns present the ATT estimates obtained when the binary confounding factor *U* is calibrated to match the observed characteristics and is then included in the set of matching variables. Under a deviation from *unconfoundedness* with a binary indicator for childhood and present time preference (it equals 1, if it is higher than the mean value, and 0 otherwise), the ATT is estimated at -0.109 and -0.080, respectively. The estimates that include those obtained using the binary indicator for time preferences do not differ much with the respect to the baseline estimates (approximately, by around 1 to 3 percentage points). All ATT estimates obtained with the simulated U in the set of matching variables reveal that TAW experience has no significant effect on the probability of moving into regular employment. This is in contrast to the significant negative effect of TAW experience on the transition probability (Table 4-A (3)) with childhood time preferences as a control. The consistent results of the negative, but insignificant effect of TAW experience (Table 6) suggest that the difference between the TAW-experienced and non-TAW may stem from the individual heterogeneity in time preferences. In other words, the difference in the probability of becoming regular employees between the TAW-experienced and non-TAW can be attributed to the difference in individual time preferences.

Secondly, Rosenbaum's (2002) procedure for bounding the treatment effect estimates (for details, see Becker and Caliendo, 2007) is used to estimate the extent to which such "selection on unobservables" may bias the probability of moving into a regular job. If there is a hidden bias, two individuals with the same observed covariates *x* have different chances of receiving the treatment. The odds that individuals receive treatment are then given by $\mathrm{P_i}/(1-\mathrm{P_i})$ and $\mathrm{P_j}/(1-\mathrm{P_j})$, and the odds ratio is given by $\frac{\mathrm{P_i}/(1-\mathrm{P_i})}{\mathrm{P_j}/(1-\mathrm{P_j})} = \frac{\mathrm{P_i}(1-\mathrm{P_j})}{\mathrm{P_j}(1-\mathrm{P_i})} = \frac{\exp(\beta\,\mathrm{x_i}+\gamma\,\mathrm{u_i})}{\exp(\beta\,\mathrm{x_j}+\gamma\,\mathrm{u_j})} = \exp\{\gamma\,(\mathrm{u_i}-\mathrm{u_j})\}$. If both units have identical observed covariates—as implied by the matching procedure—the *x* vector cancels out. To eliminate any hidden bias, u_i should be equal to u_j, implying that there are no differences in the unobserved variables; alternatively, γ should be zero, implying no influence of unobserved variables on *y*. Rosenbaum (2002) has shown that the equation implies the following bounds on the odds ratio that either of the two matched individuals will receive treatment: $\frac{1}{\mathrm{e}^{\gamma}} \leq \frac{\mathrm{P_i}(1-\mathrm{P_j})}{\mathrm{P_j}(1-\mathrm{P_i})} \leq \mathrm{e}^{\gamma}$.

[21] As $p_1 > p_0$ for females, this implies that females are more likely to be exposed to treatment, and 60% (p_{i1}) of females have had work experience in the TAW sector and later became regular employees. Given these results, by setting $p_{11} = .60$, identical fraction of individuals are assigned assuming a value of *U* equal to 1.

If $e^{\gamma} = \Gamma = 1$, it means that both matched individuals have the same probability of engaging in the TAW sector. In each bound, the Mantel–Haenszel (1959) test statistic, which is proposed for binary outcomes by Aakvik (2001), is used to assure that no unmeasured variable causes the odds of receiving the treatment to differ between the treatment and control groups. Individuals who are most likely to become TAW employees may have a higher or lower probability of moving into regular employment even without treatment, given that they have the same observatory characteristics as the individuals in the comparison group. To investigate the hidden bias that influences the assignment into treatment, Q+MH and $Q-$MH statistics are estimated, whereby the upper and lower bounds test respectively if treatment effect is over- and underestimated, respectively.[22] The significance levels on all the bounds under the assumption of overestimation and underestimation are set at $p < .01$. The test results indicate that an unmeasured variable does not appear to cause the odds of engaging in TAW to differ between TWA-experienced and non-TAW (see Appendix 2). Although it should also be noted that these tests only indirectly verify whether the *unconfoundedness* is satisfied or not, the two test results suggest that the confidence intervals for the effect of TAW employment can be deemed reliable.

7. Conclusion

TAW employment is viewed as both beneficial and harmful to one's future job prospects. From a positive perspective, temporary contracts are believed to avoid labor inflexibility to some extent. For firms, it provides a compelling incentive to utilize TAW employees as a buffer stock of employment or for leave replacement. On the other hand, for employees, TAW could act as a stepping stone to regular employment. Form a negative perspective, the low levels of retention and motivation, the lack of opportunities for career advancement, lower satisfaction in certain job components, and less work-related training are thought to be harmful aspects of TAW, because they act as deterrents to workers moving into regular employment. These characteristics may lead to a longer duration of TAW employment once an individual is hired as a temporary worker.

This study examines whether TAW employment is explained by individual heterogeneity in inter-temporal choices and whether the TAW experience has a negative or positive effect on the probability of moving into a regular job. In addition, the wages of TAW-experienced are compared to those offered to non-TAW with similar individual characteristics. Given that individual decisions on career paths, including whether to take temporary jobs, involve a trade-off between immediate costs

[22]The Q+MH ($Q-$MH) statistic adjusts the Mantel–Haenszel statistic downward (upward) for positive (negative) selection. If both Q+MH and $Q-$MH statistics are significant under the assumption of overestimation and underestimation, the estimators can be interpreted to be robust against the unobserved factors. Our results for transition probability indicate that the significance levels of Q+MH on all bounds are below the 0.01 level. With the lower value of Γ =1.5, the result of Q_{mh}^{-} is still significant at the 10% level. This suggests that the study is insensitive to the upward or downward bias.

and delayed rewards, time preferences can be thought to account for individual unobserved choice characteristics. The summary of descriptive statistics indicates that agents with TAW experience appear to be more impatient than those without. Their time preferences are inconsistent over inter-temporal choices, with higher discount rates noted in the near future than in the distant future. This suggests that TAW-experienced may display hyperbolic discounting. In particular, when controlling for confounding variables, our estimated results indicate that the degree of impatience has a statistically significant effect on the probability of engaging in the TAW.

Using PSM methods, we found control groups that have identical distributions over a substantial range with the treatment group. The results estimated inside the range of the observed data points indicate that those who have held temporary work at some point in the past are less likely to transition into regular jobs, although the effect sizes decrease or lose statistical significance when time preferences are additionally controlled for. On the other hand, wage differentials are not significant between those that have work experience as TAW employees and those that do not. To assess the robustness of the matching estimators, the present study also examines whether there are some unobserved variables that affect the selection into treatment and the outcome variable simultaneously. Any significant effects caused by an unmeasured variable regarding the transition probability are not observed, and the effects seem to be neither downward nor upward biased. This suggests that the inference in the regression results on transition probabilities would not change because of different values of the unobserved factors.

Nevertheless, we recognize that our estimation results might have to be interpreted with caution for a number of reasons. First, our time preferences may capture some elements other than impatience, such as human capital, a taste for leisure, or some other unobserved behavioral traits. For example, DellaVigna and Paserman (2005) attempt to verify that the measures of impatience do not capture human capital, by presenting no relationship between measures of impatience and reservation/reemployment wages, which are associated with human capital. In our study, we used more direct measures of impatience employing both retrospective and hypothetical questions; moreover, two different time preferences produce similar results even after we control for observed characteristics associated with human capital. However, it should still be noted that time preferences may capture some other unobserved factors that may affect the selection into TAW experience. If this holds, further study is necessary to draw precise conclusions on the causal relationship between time preferences and the transition probability. Secondly, we used a small sample whose gender and age composition is somewhat different from the government statistics. Although this may limit the generalization of the estimated results to the representative TAW workers, the results with the restricted sample by gender and age group is similar with the main results. Thirdly, as previously noted, the lack of information about the career progression restricts our ability to examine the career

choice process of the TAW workers in the exponential and hyperbolic discounting models separately. However, our results imply a significant role of time preferences in identifying the difference in the subsequent career choices between those with and without TAW experience. Lastly, our data does not ensure that the selection to treatment is not affected by some other unobserved traits. This paper, however, attempts to control for the individual heterogeneity in time preferences as one of unobserved traits to find more direct effects of the TAW experience on the transition probability; moreover, the sensitivity analysis, albeit indirectly, suggests that the estimated results do not violate the assumption of *unconfoundedness.*

Although this study cannot ascertain whether the seemingly negative effect of TAW experience during the period 2009–2010 stems from the enactment of the new legislation, its introduction can correlate with the behavioral patterns of temporary workers. Our baseline estimates that present the negative effect of TAW experience on the transition to regular employment may be interpreted with the short-run impatience for the hyperbolic discounting model, as presented by DellaVigna and Paserman (2005). If we only focus on people exhibiting hyperbolic attitudes, how the stricter legislation that impose a limitation on the contract term of temporary workers possibly affect the behavioral traits of people can be explained by the level of sophistication versus naivety. Sophisticated hyperbolic agents, who can recognize their own self-control problems, may drive them to pursue the long-term rewards that can be gained through accepting the immediate costs. In other words, if the current TAW workers are sophisticated enough to view the immediate costs as the necessary part of receiving the rewards accrued in the distant future, the strict legislation may act as a stimulus device for them to seek regular jobs more eagerly than before. This, in turn, could reduce the number of individuals preferring short-term rewards, who would otherwise have become regular workers with a better pay. However, if they are too naïve, the prohibition of the dispatch work may discourage them from finding any employment from the beginning of job search process. In this case, the policies that educate, train and monitor people to find jobs that match their abilities rather than stricter prohibition may contribute to more smooth transition to regular employment. These policy implications are supported by previous studies finding that time-inconsistent workers may benefit from policies that enhance their search intensity, rather than changing the duration or cutting the level of unemployment benefits (Laibson, 1997; Paserman, 2008). The further research with additional data that includes accurate information of career paths is required to examine how impatient agents would behave after the changes in the policy with respect to temporary agency work.

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Table 1. Definitions of variables

Variables	Definitions	Mean	Standard deviation	Minimum	Maximum
Dependent Variables (ATT estimation)					
RE (Transition to regular employment=1)	A binary indicator which equals one if the respondent was the unemployed/non-regular workers in 2009 but became regular employees in 2010 and zero if the respondent was consecutively the unemployed/non-regular woker in 2009-2010. Regular employees denote those who are directly hired by employers without a fixed-term contract.	0.215	0.411	0	1
Hourly wage in logarithmic form	Self-reported hourly wage or computed by a ratio of monthly/yearly wage to labor hours	6.910	0.408	6.247	9.348
Dependent Variable used for estimation of the propensity score					
TAW experience in the past 2 years (=1)	A binary indicator which equals 1 if the respondent has ever held temporary work for the past 2 years and 0 otherwise	0.155	0.363	0	1
Main independent variables: Behavioral Characteristics					
Childhood time preference	Response to the question "When did you plan to do your homework assignments?" on a 5-point scale, from 1 (at the beginning of the vacation) to 5 (at the end of the vacation)	3.403	1.323	1	5
Present time preference	Responses to the question "Let's assume that you were required to spend time cleaning a park, and you have the option to shorten the hours by one hour today or shorten some hours in 7 days" Discounting rates for every choice computed and converted to discounting rates for near future (today vs in 7days) and distant future (90 days vs 97 days) inter-temporal choices	0.173	0.471	-0.464	0.978
Demographic Variables					
Age	Ages of repondents	43.714	9.586	21	60
Household income (excluding oneself)	Per-capita household income (excluding oneself) in million yen.	4.387	3.485	0	19.5
Household property (Land / Housing)	Per-capita household property including lands and housings in million yen	15.209	18.086	0	100
Household financial assets	Per-capita household financial assets in million yen	7.771	11.443	1.25	100
Household housing loans	Per-capita household mortgages in million yen	6.003	8.687	0	30
Household other debts	Per-capita household debt holding other than mortgages in million yen	0.742	1.834	0	10
Number of children	Number of children at the time of survey	1.714	1.075	0	5
Married (=1)	A binary indicator for marital status which equals 1 if married and 0 otherwise	0.775	0.418	0	1
Educational Level	(1) Lower than middle school level (Base)	0.042	0.201	0	1
	(2) High school level	0.494	0.500	0	1
	(3) Junior college	0.274	0.446	0	1
	(4) University	0.182	0.386	0	1
	(5) Higher than graduate school level	0.009	0.093	0	1
Female (=1)	A binary indicator for females which equal 1 for female repondents 0 otherwise	0.785	0.411	0	1

Note: The descriptive statistics are calculated based on the samples used for the main analysis of the transition probability with childhood time preferences (N = 573). The samples are derived from the Japanese labor force aged 21-60 in 2010, who are either regular/non-regular workers and the unemployed searching for a job.

Table 2. Descriptive statistics of treated and control groups

TAW experienced (Treated) versus non-TAW (Matched)	Childhood Time Preference (N=573)						Current Time Preference (N=488)					
	Treated		Matched Controls		All Controls		Treated		Matched Controls		All Controls	
Variables	Mean Value (Mean)	Standard Deviation (S.D)	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Dependent Variable (ATT estimation)												
RE (Transition to regular employment=1)	0.112	0.318	0.230	0.422	0.233	0.423	0.135	0.344	0.227	0.420	0.230	0.421
Hourly wage in logarithmic form*	6.908	0.372	6.904	0.414	6.910	0.415	6.893	0.390	6.898	0.389	6.911	0.406
Dependent Variable used for estimation of the propensity score												
TAW experience in the past 2 years (=1)	1.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000
Main independent variables: Behavioral Characteristics												
Childhood time preference	3.693	1.342	3.455	1.330	3.431	1.340						
Present time preference							0.293	0.503	0.188	0.455	0.181	0.456
*Time inconsistent preferences***												
Near Future (inter-temporal choices between today and in 7 days)							0.293	0.503	0.188	0.455	0.181	0.456
Distant Future (inter-temporal choices between in 90 days and in 97 days)							0.272	0.488	0.192	0.440	0.182	0.443
Demographic Variables												
Age	43.709	9.136	45.127	9.346	45.327	9.315	43.547	9.320	45.012	9.306	45.217	9.269
Household income (excluding oneself)	3.417	3.346	3.114	3.191	3.156	3.267	3.363	3.321	3.143	3.202	3.189	3.292
Household property (Land / Housing)	16.004	19.468	16.417	18.151	17.396	19.455	16.297	20.677	16.465	18.136	17.460	19.538
Household financial assets	6.073	8.022	7.756	8.680	10.320	15.162	6.557	8.600	8.115	9.553	10.462	15.350
Household housing loans	5.217	8.254	6.793	9.015	6.766	9.075	4.587	7.531	6.492	8.830	6.706	9.054
Household other debts	0.811	2.066	0.795	1.902	0.812	1.958	0.731	1.822	0.772	1.843	0.792	1.913
Number of children	1.575	1.218	1.743	1.093	1.743	1.090	1.491	1.252	1.727	1.089	1.735	1.086
Married (=1)	0.654	0.478	0.808	0.394	0.809	0.393	0.632	0.485	0.799	0.401	0.804	0.397
(1) Lower than middle school	0.039	0.195	0.039	0.193	0.038	0.190	0.047	0.213	0.037	0.189	0.035	0.184
(2) High school	0.480	0.502	0.474	0.499	0.466	0.499	0.519	0.502	0.472	0.499	0.459	0.498
(3) Junior college	0.252	0.436	0.173	0.378	0.169	0.374	0.226	0.420	0.173	0.379	0.168	0.374
(4) University	0.205	0.405	0.289	0.453	0.298	0.458	0.179	0.385	0.285	0.452	0.305	0.461
(5) Higher than graduate school	0.024	0.152	0.026	0.159	0.029	0.169	0.028	0.167	0.032	0.176	0.032	0.177
Female (=1)	0.685	0.466	0.421	0.494	0.412	0.492	0.679	0.469	0.429	0.495	0.416	0.493

Note: "Treated" indicate those who have at some point engaged in TAW sector and "All controls" are those who never worked in the TAW sector. "Matched Controls" refer to the individuals in "All Controls" who have been matched to those in the "Treatment" group, with respect to their observable covariates. * The sample sizes used for the analysis of hourly wages are 540 (childhood) and 458 (present) respectively. ** For analysis with present time preference, we used the question about near future inter-temporal choices. The results obtained using either near future or distant future choices do not differ significantly. We included these statistics to indicate whether the agents in the treatment group (with TAW experience) display hyperbolic features.

Table 3. Effects of TAW experience and time preferences

Dependent Variables	RE (Transition to regular employment=1)		TAW experience (=1)	
Models: Logit Regression	(1)	(2)	(3)	(4)
TAW experience in the past 2 years (=1)	-1.1091***	-0.7798*		
	(0.400)	(0.414)		
Discounting parameters				
Childhood time preference	0.1295		0.1036**	
	(0.097)		(0.052)	
Present time preference		-0.0989		0.2817*
		(0.295)		(0.155)
Individual Characteristics				
Household income (excluding him/herself)	-0.1093***	-0.0999**	-0.0198	-0.0192
	(0.042)	(0.045)	(0.023)	(0.025)
Age	-0.0296**	-0.0330**	0.0015	-0.0003
	(0.015)	(0.016)	(0.008)	(0.009)
Household property	0.0071	0.0057	0.0061	0.0064
(Land / Housing)	(0.007)	(0.008)	(0.004)	(0.004)
Household financial assets	0.0147	0.0121	-0.0181**	-0.0147
	(0.011)	(0.012)	(0.009)	(0.009)
Household housing Loans	-0.0059	-0.0153	-0.0177**	-0.0254**
	(0.016)	(0.018)	(0.009)	(0.010)
Household other debts	-0.0915	-0.1217	-0.0112	-0.0368
	(0.072)	(0.086)	(0.039)	(0.053)
Number of children	0.0186	0.1082	0.0466	0.0393
	(0.146)	(0.157)	(0.078)	(0.083)
Married (=1)	0.3395	0.2194	-0.3284*	-0.3307
	(0.359)	(0.386)	(0.190)	(0.204)
Educational Attainment				
High school (=1)	-0.1468	-0.3243	0.4037	0.4729
	(0.577)	(0.604)	(0.393)	(0.418)
Junior college (=1)	-0.6622	-0.7372	0.4386	0.4293
	(0.638)	(0.672)	(0.408)	(0.437)
University (=1)	0.4030	0.2522	0.4914	0.4315
	(0.612)	(0.644)	(0.417)	(0.453)
Higher than graduate school (=1)	-0.1609	-0.2670	1.3084*	1.2569*
	(1.252)	(1.269)	(0.737)	(0.744)
Female (=1)	-2.0757***	-2.2927***	0.2671	0.2322
	(0.274)	(0.299)	(0.179)	(0.193)
Constants	0.8030	1.2584**	-1.6959***	-1.2900**
	(0.503)	(0.490)	(0.564)	(0.579)
Number of Observations	573	488	573	488
LR statistic	145.46***	132.26***	26.51***	25.08**
Log-Likelihood	-225.267	-187.984	-234.185	-193.396

Note: The dependent variables presented in columns (1) and (2) refer to the binary indicator that equals one if a respondent was unemployed/ a non-regular worker in 2009 but became regular worker in 2010, and zero if the respondent was unemployed/a non-regular worker in both 2009 and 2010. Columns (3) and (4) present the results pertaining to the effect of time preferences on the probability of engaging in TAW sector. The results presented in columns (1) and (3) are based on the analysis using the childhood time preferences, calculated from the response to the question "When did you plan to do your homework assignments?" on a 5-point scale, from 1 (at the beginning of the vacation) to 5 (at the end of the vacation). The results presenteed in columns (2) and (4) use the present time preferences calcuated from responses to the hypothetical question to measure discounting rate: "Let us assume that you were required to spend some time cleaning a park, and you have the option to shorten the hours by one hour today or reduce the hours in 7 days." Standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 4. Effect of TAW experience on regular employment

4-A. Estimation with childhood time preference

		Model: ATT estimation (Mean difference), Depedent Var: : Transition to regular employment (=1)				
		Treated Group	Control Group	ATT	Std. Err.	T value
(1)	No independent var.	89	484	-0.155	0.04	-3.892
(2)	Only demographic var.	89	74	-0.169	0.066	-2.545
(3)	Childhood time preferences added to row (2)	89	75	-0.124	0.065	-1.906
		ATT Estimation With Restricted Samples (Controlloing for all confounding variables)				
		Treated Group	Control Group	ATT	Std. Err.	T value
(4)	Male	17	14	-0.353	0.18	-1.966
(5)	Female	70	61	-0.114	0.059	-1.926
(6)	Young cohort (less than the median age)	49	41	-0.163	0.086	-1.906

4-B. Estimation with present time preference

		Model: ATT estimation (Mean difference), Depedent Var: : Transition to regular employment (=1)				
		Treated Group	Control Group	ATT	Std. Err.	T value
(1)	No independent var.	73	415	-0.092	0.045	-2.021
(2)	Only demographic var.	73	60	-0.082	0.072	-1.139
(3)	Present time preferences added to row (2)	73	57	-0.055	0.071	-0.77
		ATT Estimation With Restricted Samples (Controlloing for all confounding variables)				
		Treated Group	Control Group	ATT	Std. Err.	T value
(4)	Male	15	11	-0.267	0.206	-1.297
(5)	Female	56	48	-0.089	0.069	-1.285
(6)	Young cohort (less than the median age)	39	36	-0.051	0.085	-0.606

4-C. Estimation with samples who answered both childhood and present time preferences

		Model: ATT estimation (Mean difference), Depedent Var: : Transition to regular employment (=1)				
		Treated Group	Control Group	ATT	Std. Err.	T value
(1)	No independent var.	68	404	-0.081	0.048	-1.679
(2)	Only demographic var.	68	60	-0.147	0.074	-1.974
(3-1)	Childhood time preferences	68	55	-0.103	0.079	-1.304
(3-2)	Present time preferences	68	57	-0.103	0.078	-1.325

Note: After using the PSM method to identify the control groups that are distributed identically, the mean difference in probability of being RE across the TAW-experienced and non-TAW with similar observed characteristics was calculated. The results given in Table 4-A are obtained from the ATT estimations when "childhood time preferences" are used as the proxy for "impatience" and those in Table 4-B follow the structure of 4-A, but use the "present time preference." Row (1) depicts the estimation results obtained without independent variables, those presented in row (2) are obtained by including demographic variables (educational attainment, the household income, financial/real assets, housing loans/debts, age, marital status, number of children and gender), and row (3) depicts the outcome of using all confounding variables (demographic variables and time preferences). Rows (4) and (5) reveal the results pertaining to restricted samples by gender, and (6) reveals those for young cohort (less than the median age). The results given in Table 4-A are obtained when the samples restricted to those who provided answers to both childhood and present time preferences (both near and distant future inter-temporal choices) are used for the analyses. ATT estimation is obtained by nearest neighbor matching method (random draw version) and "Std. Err." denotes analytical standard errors.

Table 5. Effect of TAW experience on hourly wages

5-A Estimation with childhood time preference

		Model: ATT estimation (Mean difference), Depedent Var: Hourly Wage (Log)				
		Treated Group	Control Group	ATT	Std. Err.	T value
(1)	No independent var.	89	451	-0.002	0.044	-0.056
(2)	Only demographic var.	89	73	0.01	0.061	0.168
(3)	Childhood time preferences added to row (2)	89	71	-0.011	0.068	-0.164
		ATT Estimation With Restricted Samples (Controlloing for all confounding variables)				
		Treated Group	Control Group	ATT	Std. Err.	T value
(4)	Male	17	14	-0.093	0.167	-0.559
(5)	Female	70	54	0.09	0.054	1.674
(6)	Young cohort (less than the median age)	49	39	0.102	0.064	1.592

5-B Estimation with present time preference

		Model: ATT estimation (Mean difference), Depedent Var: Hourly Wage (Log)				
		Treated Group	Control Group	ATT	Std. Err.	T value
(1)	No independent var.	73	385	-0.018	0.05	-0.369
(2)	Only demographic var.	73	56	-0.022	0.072	-0.304
(3)	Present time preferences added to row (2)	73	52	-0.01	0.082	-0.125
		ATT Estimation With Restricted Samples (Controlloing for all confounding variables)				
		Treated Group	Control Group	ATT	Std. Err.	T value
(4)	Male	15	9	0.094	0.196	0.482
(5)	Female	56	44	-0.045	0.081	-0.557
(6)	Young cohort (less than the median age)	39	34	-0.025	0.07	-0.351

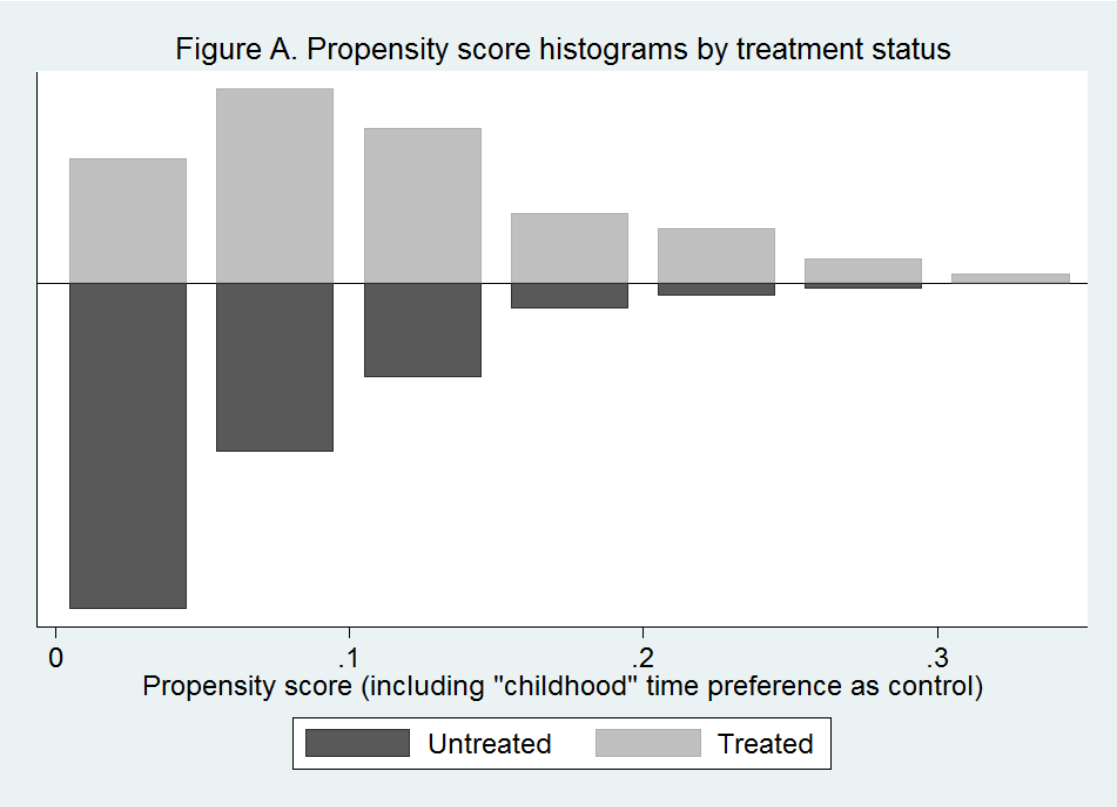
Note: After using the PSM method to identify the control groups that are distributed identically, the mean difference in probability of being RE across the TAW-experienced and non-TAW with similar observed characteristics was calculated. The results given in Table 4-A are obtained from the ATT estimations when "childhood time preferences" are used as the proxy for "impatience" and those in Table 4-B follow the structure of 4-A, but use the "present time preference." Row (1) depicts the estimation results obtained without independent variables, those presented in row (2) are obtained by including demographic variables (educational attainment, the household income, financial/real assets, housing loans/debts, age, marital status, number of children and gender), and row (3) depicts the outcome of using all confounding variables (demographic variables and time preferences). Rows (4) and (5) reveal the results pertaining to restricted samples by gender, and (6) reveals those for young cohort (less than the median age). ATT estimation is obtained by nearest neighbor matching method (random draw version) and "Std. Err." denotes analytical standard errors.

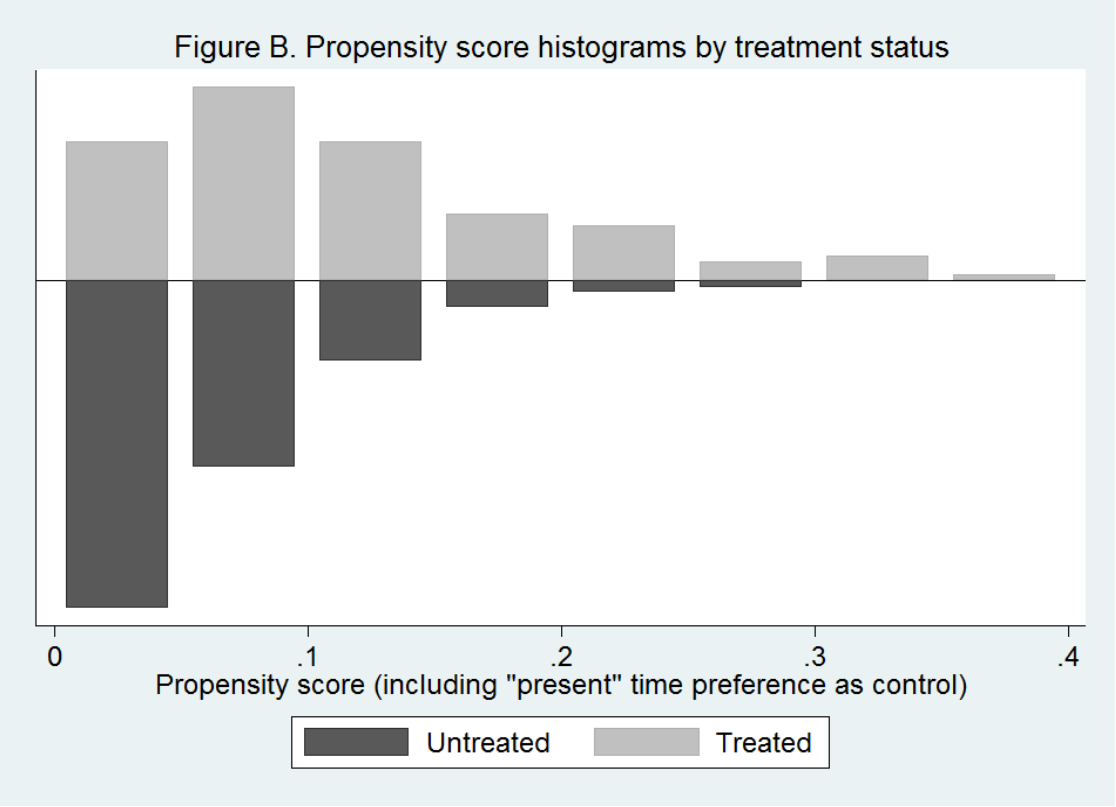
Table 6. Effect of "calibrated" confounders

Dependent Var.: Probability of transition to regular employment (=1)										
	Fraction U=1 by treatment/outcome				Fraction U=1 by treatment		Childhood Time Preference		Present Time Preference	
	p11	p10	p01	p00	p1.	p0.	ATT	s.e.	ATT	s.e.
No confounder	-	-	-	-	-	-	-0.124	0.065	-0.055	0.071
U like:										
Female	0.60	0.84	0.39	0.90	0.81	0.78	-0.126	0.08	-0.090	0.089
Married	0.50	0.70	0.72	0.82	0.67	0.79	-0.123	0.083	-0.095	0.085
Junior College	0.00	0.30	0.13	0.32	0.27	0.27	-0.105	0.077	-0.072	0.083
University	0.40	0.16	0.29	0.15	0.19	0.18	-0.098	0.081	-0.080	0.087
Graduate School	0.10	0.01	0.01	0.01	0.02	0.01	-0.128	0.078	-0.084	0.086
Childhood Time Preference	0.80	0.68	0.65	0.57	0.70	0.59	-0.109	0.079		
Present Time Preference	0.30	0.49	0.34	0.35	0.47	0.34	-	-	-0.080	0.087

As proposed by Ichino et al. (2007), the sensitivity of ATT matching estimates is examined. U is considered as any other observed characteristics. The probability U = 1 in each of the four groups is defined by the treatment status and the outcome value, allowing the value of the confounding factor for each member of the treatment and conrol group to be predicted. The ATT estimates, including the simulated U in the set of matching variables, are re-estimated by applying nearest neighbor propensity score matching. We only report the probabilities U = 1 by treatment/outcome and by treatment based on childhood time preference because they are almost identical to the probabilities based on present time preferences.

Appendix 1. Propensity score histograms by treatment status





Appendix 2. Mantel–Haenszel test statistics

Probability of transition to regular employment (=1)								
	Childhood time preference				Present time preference			
Gamma	Q_mh+	Q_mh-	p_mh+	p_mh-	Q_mh+	Q_mh-	p_mh+	p_mh-
1	3.878	3.878	0.000	0.000	4.047	4.047	0.000	0.000
1.05	4.069	3.705	0.000	0.000	4.231	3.882	0.000	0.000
1.1	4.243	3.532	0.000	0.000	4.398	3.717	0.000	0.000
1.15	4.411	3.368	0.000	0.000	4.559	3.559	0.000	0.000
1.2	4.572	3.211	0.000	0.001	4.713	3.409	0.000	0.000
1.25	4.727	3.061	0.000	0.001	4.861	3.265	0.000	0.001
1.3	4.876	2.917	0.000	0.002	5.005	3.127	0.000	0.001
1.35	5.020	2.778	0.000	0.003	5.143	2.995	0.000	0.001
1.4	5.160	2.646	0.000	0.004	5.277	2.868	0.000	0.002
1.45	5.295	2.518	0.000	0.006	5.406	2.745	0.000	0.003
1.5	5.426	2.394	0.000	0.008	5.532	2.627	0.000	0.004
1.55	5.553	2.275	0.000	0.011	5.653	2.513	0.000	0.006
1.6	5.676	2.160	0.000	0.015	5.772	2.403	0.000	0.008
1.65	5.796	2.048	0.000	0.020	5.887	2.296	0.000	0.011
1.7	5.913	1.940	0.000	0.026	5.999	2.193	0.000	0.014
1.75	6.027	1.835	0.000	0.033	6.108	2.093	0.000	0.018
1.8	6.138	1.734	0.000	0.041	6.215	1.995	0.000	0.023
1.85	6.246	1.635	0.000	0.051	6.318	1.901	0.000	0.029
1.9	6.352	1.539	0.000	0.062	6.420	1.809	0.000	0.035
1.95	6.456	1.445	0.000	0.074	6.519	1.720	0.000	0.043
2	6.557	1.354	0.000	0.088	6.616	1.633	0.000	0.051

Note: Gamma is log odds of differential selection into treatment due to unobserved factors; Q_mh+ and Q_mh － indicate Mantel–Haenszel statistics ; p_mh+ and p_mh－indicate significance level of assumptions regarding overestimation and underestimation of treatment effect.