

# Size-specific Effects in Job Reallocation and Worker Mobility: Japan's Experience from the 1990s

April 2014

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## Abstract<sup>2</sup>

*This study finds a strong and positive correlation between the net job-creation rates of large employers and labor market tightness (i.e., ratio of job offers to job-seekers) in business cycle frequencies in Japan. This correlation is much stronger than that seen among smaller employers, and is mainly due to pro-cyclicality in job creation at large firms. Furthermore, large firms offer relatively higher wages to job-changers at the point of job transition in a tight labor market than do small firms. However, such pro-cyclicality in wage offers are less evident at large firms conditioned with the change in the level of new vacancies. One of the background factors for the weak pro-cyclicality of wage offers by large firms could be that they offer a superior internal market.*

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<sup>2</sup> The original version of this paper was prepared for the NBER-ESRI workshop in the summer of 2013. I appreciate the insightful comments from Shigeru Fujita, as well as from the workshop participants. The micro-level dataset used in this study was made available in May 2013 by Japan's Ministry of Health, Labour and Welfare.

## 1. Introduction

This study presents empirical evidence that, within Japan's labor market, the net employment growth of large employers correlates quite strongly with aggregate market tightness in business cycle frequencies—more so than the net growth of small employers. This finding is consistent with results seen in the US labor market, as recently discussed by Moscarini and Postel-Vinay (2012). My major findings are summarized below.

First, in the 1990s and 2000s, the differential growth rate of employment between large and small firms correlated positively with the cyclical movements of the aggregate labor market (i.e., a detrended ratio of job offers to job-seekers [labor market tightness]). This positive correlation is robust to various definitions of what constitutes a “large” or “small” firm. The net employment growth of large firms varies to a greater extent around its trend than is the case with small firms.

Second, both the job creation and job destruction of large firms strongly correlate with labor market tightness, which mainly yields a positive correlation between differential growth and market tightness. On the other hand, neither the job creation nor destruction of small firms co-moves with labor market tightness.

Third, with regard to wage offers to job-changers, both large and medium firms offer more procyclical wages at the point of job transition than do small firms. Conditional on the increase in labor demand, medium firms offer even more procyclical wages than large firms. This indicates the possibility that facing a competitive environment in a tight labor market, medium firms need to offer high wages to attract workers from other firms or the unemployment pool, as they need to compete with large firms in poaching employees at small firms, and also need to compete with the other firms in trying to hire workers from the unemployment pool. Weaker procyclicality of wage offers to new entrants in large firms than medium ones might be linked to the fact that large firms have developed internal markets, and thus they have lower worker separation rates over business cycles than small or medium firms.

This research is motivated by the seminal work of Moscarini and Postel-Vinay in recent years (2008, 2012). There have been many detailed studies on job-creation and destruction trends, worker accession, and separation in Japan's labor market (e.g., Teruyama and Genda, 2001, 2009), but to the best of my knowledge, only Teruyama and Genda (2001) and Genda (2004) discuss the relationship between the business cycle and job creation by firm size. In any case, no study thus far has focused mainly on differences in net employment growth by firm size.

The literature has discussed whether small firms are more cyclically sensitive or more sensitive to policy shocks in terms of their sales or profits (e.g., Gertler and Gilchrist, 1994). Furthermore, a sort of myth has developed that says that Japanese large firms do not dismiss their regular employees even during a contraction, because of either the lifetime employment system or strong legal restrictions on dismissals. This leads us to assume that, in terms of both worker mobility and job turnover, large firms are less volatile over business cycles than are small ones. The literature discusses how the higher job creation and destruction rates are, the smaller firm size tends to be (Teruyama and Genda, 2001), while Genda (2004) raises the point of a possible “regression fallacy” that overemphasizes the role of medium and small firms in job creation.

On the other hand, with regard to the relationship between firm size and employment growth, Haltiwanger et al. (2011) carefully examine the relationship between net employment growth and its components, and firm size and age by using the data of the US firms. They argue that no systematic relationship is observed between net employment growth and firm size, once firm age is controlled. Firm age can obviously be an important factor that affects firms’ net employment growth in Japan as well (e.g. Fukao and Kwon (2012)), while this issue is out of scope of the discussion of this research.

Besides the issue of the relationship between net employment growth and the business cycle, I also investigate how cyclical movements affect wage offers to new entrants, and whether the link between cyclical factors and wage offers vary with firm size. In the theoretical framework of Moscarini and Postel-Vinay (2008), they argue that the growth rate of real wages exceeds its trend in a tight labor market and falls below its trend in a slack labor market; this phenomenon is fueled by the evolution of employment by firm size and job-to-job transitions over cycles. Although employment growth and wage offers are most likely determined simultaneously at the firm or establishment level, micro-level dataset that contains the information of both wage offers and employment growth is not available. Therefore, I examine the behavior of the wages of job-changers over the business cycle, independent of analysis of net employment growth. Many influential studies examine how wages depend on contemporaneous aggregate influences (e.g., Kydland and Prescott, 1982). Furthermore, a number of studies present evidence that wages depend on functions of the histories of aggregate labor market conditions, even after the current aggregate and individual conditions have been taken into account. For example, several studies argue that recessions have a persistent impact on subsequent wages, and that the business cycle phases at the time of entering the labor market impinge upon future wages (Genda, Kondo, and Ohta, 2010). Beaudry and DiNardo (1991) find that wages depend much more strongly on the lowest unemployment rate since the start of a job than on the current unemployment rate. On the

other hand, Hagedorn and Manovskii (2013) find that current wages depend only on current aggregate labor market conditions and idiosyncratic match-specific productivities, while past aggregate labor market conditions have an explanatory power only with respect to current wages because they correlate with match qualities.

Regarding the wage of job changers at the point of job transition, Pissarides (2009) concludes that the elasticity of wages of new hires with regard to the change in unemployment rate is quite high. Several studies pointed out that such procyclicality arises not only because of the high aggregate productivity level, but it may rather reflect cyclical movements in the composition of job quality (Barlevy, 2001). Recent works including Gertler and Trigari (2009) and Martins et al. (2012) take this aspect into account, and analyze the procyclicality of the wages of new hires with the control of both worker and job characteristics. The former obtains the result that any wage procyclicality of new hires disappears once job fixed effects are controlled, while the latter finds the evidence in favor of wage procyclicality having controlled for worker and job characteristics. Galuscak et al. (2012) takes a different approach and finds complementary evidence that wages of new hires are more procyclical than those of incumbents, while job or firm characteristics including the coverage of collective bargaining are also closely linked to the wages of newly hired employees. At the same time, they pointed out that the majority of European firms surveyed responded that they rather take into account the internal factors, not external factors in their wage settings.

Another strand of previous study argues that the selection of wage measure is critical to examine the procyclicality of wages. A number of studies have found real wage cyclicity among both job stayers and job movers with regard to hourly wages (e.g. Devereux, 2001). Recent work by Anger (2011) found strong procyclicality only with respect to effective wages, which take into account overtime and bonus pay, as well as unpaid overtime.

## 2. Data

I employ two micro-level datasets in my analysis. The first dataset is from the Employment Trend Survey (published by Japan's Ministry of Health, Labour and Welfare [MHLW]) over a 21-year period (1991–2011). This is an establishment survey with two survey timings each year (i.e., the end of June and the end of December). I exclude from the scope of my estimation those establishments affiliated with public firms. I examine the inflows and outflows of regular workers<sup>3</sup> at each establishment, during the six-month period preceding

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<sup>3</sup> A "regular worker" is someone who corresponds to either of the following categories: (1) employed without any specific contract period, (2) hired with a contract period exceeding one month, or (3) employed with a period shorter than one month

each survey point (i.e., January–June and July–December).

The survey consists of three different questionnaires. The first is called the Establishment Questionnaire, which surveys the number of existing workers, inflow workers, and outflow workers, by worker attributes at each establishment. In addition, it collects information on basic establishment characteristics: the size of the firm with which it is affiliated, the industry, and the age structure of regular workers<sup>4</sup>. The second is the Questionnaire of New Entrants, which captures data on many detailed characteristics of newly hired workers. This questionnaire makes inquiries into the entrants' former careers, and the size of their previous employers (if any) as well as wage changes from the wage at previous job (if any). The third is called the Questionnaire of Leavers, which asks for details on workers that left the establishment. The sample covers all industries except agriculture and fisheries, and it contains around 10,000–13,000 establishments for each survey. Once extracted, the establishments are asked to respond to the questionnaire twice (i.e., the June and December surveys). This allows me to trace changes in the number of workers per establishment through the full year, for all establishments.

Because I limit the sample to those establishments observed throughout a one-year period, information on those establishments that appeared or disappeared during that year is excluded. Therefore, it should be noted that any increase or decrease in jobs caused by the opening or closing of establishments is ignored<sup>5,6</sup>.

More precisely, the establishment questionnaire asks about (1) the number of regular workers at the end of the preceding period, (2) the increase in workers during the survey period, (3) the decrease in workers during the survey period, and (4) the number of regular workers at the end of the survey period. By using this information, I can exclude those observations where there are inconsistencies in the numbers between the first half and the second half of each year<sup>7</sup>. All the establishments are asked to provide the aforementioned information, along with a breakdown of regular part-time<sup>8</sup> workers; this allows me to focus on regular full-time

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or employed on a daily basis, and who were actually employed for more than 18 days during the preceding two months. In this study, I mainly focus on firm hiring behavior vis-à-vis workers categorized as (1).

<sup>4</sup> This question is included only in the June survey.

<sup>5</sup> However, it is possible to partially reflect the effect of establishment openings and closings through changes in the multiplying factor attached to the same establishment, from the June survey to the December one.

<sup>6</sup> The Japanese literature actually uses the difference in the multiplier within the same establishment to capture the impact of establishment openings and closings. In this study, however, I do not follow this method, as (1) it covers only a portion of the job creation and destruction caused by establishment openings and closings, and (2) it is argued that such a methodology can contain a certain extent of measurement error (Teruyama and Genda, 2001).

<sup>7</sup> I also checked for consistency in the categories of firm size and industry classification. If neither of them coincided between the two responses, I also dropped such records from the sample. As a result, I obtained around 342,000 observations across 42 periods.

<sup>8</sup> “Regular part-time workers” are those employed as regular workers under a contract featuring relatively fewer work hours per day, or fewer work days per week, compared to their colleagues. I label the remaining regular workers as “regular

workers by subtracting from the total the number of part-time workers.

The workers captured in this survey are limited only to regular workers; neither dispatched workers nor contract workers are included. Furthermore, both workers employed at small establishments with fewer than five employees and those who are self-employed remain outside the scope of this study.

Furthermore, I construct three short panel datasets from this micro-level data collected through the Employment Trend Survey. The sampling of establishments is based on the general population of establishments, from the Establishment and Enterprise Census of the Ministry of Internal Affairs and Communications. The creation of panel datasets of the establishments is possible for the 2006–2008 and 2009–2011 periods, with common numbers assigned to the same establishments through the use of the same Census results. In addition, for the 1993–1995 period, it is generally considered that the dataset can be panelized.<sup>9</sup> In the creation of these datasets, I first check the consistency in the number of employees at the end of the first half of the year, and that at the beginning of the second half. Next, I check the consistency in the number of employees at the same establishment as of the end of the previous year, and as of the beginning of the current year. Theoretically, these two figures should coincide; it can be the case that several employees leave or join at the end of the year or at the beginning of the year, but change can be reflected only in one of them. I thus allow for up to a 50% discrepancy in the total number of employees. This leaves 15,640 observations for the 1993–1995 panel, 2,454 observations for the 2006–2008 panel, and 6,971 observations for the 2009–2011 panel. I need to note that as the length of the three panels is limited (i.e., six periods for each), I can analyze only limited phases of particular business cycles whose characteristics can be varied. The summary statistics of each panel (Table A-2) reveal that the size compositions of the establishments included in each panel differ, which could affect estimation results with regard to size-specific effects.

Regarding changes in wage levels before and after job transitions, the Questionnaire of New Entrants includes a question on the extent of wage changes, with a choice of five or seven interval categories. I take the mid-value of each category (e.g., a category featuring an increase of less than 10% is treated as a 5% increase)<sup>10</sup>.

The second dataset is constructed from micro-level data captured through the Basic Survey

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full-time workers.”

<sup>9</sup> For further details, see Genda (2004).

<sup>10</sup> The end values are used for the categories at both ends. I note that there is a gap in the wage-change responses between 1997 and 1998, because of the changes in the numbers of choices (i.e., up to 1997, the number was five, and after 1998, it was seven).

on Wage Structure (henceforth, BSWS), compiled annually by the MHLW between 1991 and 2012 (22 periods). This survey is conducted in June of each year and contains establishments randomly chosen from all regions and all industries in Japan, save for agriculture. The annual number of observations is approximately 1.5 million workers, from 60,000–70,000 establishments. The population includes all establishments with 10 or more employees in both the private and public sectors, and all establishments that belong to private firms with five to nine employees. In addition to filling out an establishment survey, the selected establishments are asked to randomly extract worker information from their payroll records, at the individual-worker level. The establishment and individual files were merged using an establishment identification number. The unit of analysis is the individual worker, along with the relevant information of the establishment to which he or she belongs. To focus on trends with regard to wages offered to job-changers, the extent of the sample used in the analysis is limited to regular full-time workers with less than one year of tenure<sup>11</sup> and with previous work experience in the same occupation, who are currently working at private establishments. The dataset employed for the analysis contains 536,887 observations, the summary statistics of which are shown in Appendix Table A-3. Further, as the information on previous work experience in the same occupation is not available for the majority of white-collar workers (e.g. clerks), I construct a supplementary dataset by comparing the actual tenure and the theoretical tenure<sup>12</sup>. This dataset contains 775,177 observations.

Specifically, the survey instrument asks a respondent from an establishment to fill in the wage amount paid on a regular basis that contain pays for overwork (i.e. “Monthly contractual wage,” henceforth regular wage), based on the establishment’s payroll records. Following the methodology seen in the literature (e.g., Hagedorn and Manovskii, 2013), I employ the logarithmic value of real regular wage per work hour, which is equal to the regular wage (excluding overtime allowance) divided by regular work hours or the regular wage divided by total work hours per month and by consumer price index (CPI). In addition, as an alternative measure of wage levels, given that there exists a long-term increasing trend in wages over 22 years of time, I deflate the original value of the regular wage by a deflator, which is the ratio of the average wages of the current year to those of the base year (i.e., 2012) among all workers working at the establishments affiliated to the firm of the same size. By using this deflator, I can remove the impact of the general trend by firm size in average wages among all workers.

Other variables used for the estimation include age, education level, gender, years of

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<sup>11</sup> The information on tenure is collected at the year scale. However, as the majority of regular full-time workers start their contracts at the beginning of the fiscal year (i.e., April 1), the wage level of these workers in June can be considered approximately the same as the wage level offered when the workers joined the establishment.

<sup>12</sup> Theoretical tenure corresponds to the difference between a worker’s current age and her age upon graduation. This should contain measurement errors, although alternative information is not available from the original dataset. I drop the samples with the responses on “years of previous experience in the same job” from this supplementary dataset.

experience in the same kind of jobs as the current job, occupational category<sup>13</sup>, and firm attributes, including the number of permanent workers, firm size, and location.

As indicators of aggregate economy, I employ varied statistics including labor market tightness at a national level (ratio of vacancies to the unemployed), labor market tightness at a prefectural level<sup>14</sup>, growth rate of new vacancies by firm size, unemployment rate, and unemployment rate by age groups. For some of the analyses, I also employ the data of the “future prospect of business conditions” of individual firms from the Short-Term Economic Survey of Enterprises in Japan (Tankan). These are all statistics that are publicly available. All statistics except for Tankan data are available as seasonally adjusted series, and are converted at a quarterly or biannual basis.

### 3. Methodology and Major Results

The first goal of this study is to document changes in employment in Japan by employer size, from the 1990s; it does so while focusing on changes in business cycle frequencies. Based on the results, the second goal is to analyze changes in job flows and worker mobility for the corresponding period by employer size.

#### 3.1 Basic methodology

Following the methodology of Moscarini and Postel-Vinay (2012), I focus on the difference in employment growth rates between large firms and small firms. Based on their motivation, employer size is determined by the number of employees, not capital or sales. If this difference is positive, it implies that large employers are growing more quickly, and that they hold a larger share of employees than small or medium firms. If it is negative, small employers are growing more quickly, with the result being that all employers will be similar in size in the long term. To define “small” and “large” firms or establishments, I use two criteria: one is based on the firm size to which the surveyed establishment is affiliated, and the other is based on the establishment size itself<sup>15</sup>. To be more precise, private firm size is divided in the questionnaire into five categories. In the following analysis, I use the largest category (over 1,000 workers) as “large firms” and the smallest category (5–29 workers) as “small firms”; this largest category holds the largest share of regular full-time employees,

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<sup>13</sup> During the observed 22 years, classification of occupations is modified several times. For the analysis, I only employ the data of 129 occupations that exist in the most recent classification.

<sup>14</sup> I employ vacancies and new vacancies at a national level without those of part-timers. However, at a prefectural level, only numbers of vacancies that include those of part-timers are available.

<sup>15</sup> With regard to the number of workers per establishment, the exact number is available; I categorize establishments with fewer than 50 regular workers as “small firms,” and those with more than 500 regular workers as “large firms.” Even when I set the latter threshold to 1,000 instead of 500, the major implication of the following analysis holds.



while the smallest category holds the second-largest share. Furthermore, the sum of the shares of the two categories exceeds 50%<sup>16</sup>, thus representing a weight sufficient for analysis. Further, Teruyama and Genda (2001) argue that, on average, job creation among the existing firms in the largest and smallest size categories of the Employment Trend Survey corresponds to 54% of the total, and that job destruction among these firms corresponds to 57% of the total<sup>17</sup>. In addition, I consider firms with 30–299 workers as “medium firms”<sup>18</sup>. The firm-size criterion has an advantage: it is scarcely affected by “reclassification bias”<sup>19</sup>. Thus, I use the first criterion (i.e., firm-based criterion) as my major one. Except for very small ones, firms usually have several establishments; thus, positive or negative growth in employment at one of the establishments is less likely to immediately change firm size than would be the case when using establishment-based criteria.

Let  $L_{jt}$  denote the number of employees working with establishment  $j$  at time  $t$ , and  $F_{jt-1}$  denote the number of those working at the firm to which establishment  $j$  is affiliated at the end of time  $(t-1)$ . In the following analysis, I focus on the employment trend with respect to regular full-time workers<sup>20</sup>. Under the firm-based criterion, I calculate the growth rate between  $(t-1)$  and  $t$  of employment at all large employers as follows:

$$g_t^{LARGE} = \frac{\sum_{j:F_{jt-1} > \bar{L}} (L_{jt} - L_{jt-1})}{\sum_{j:F_{jt-1} > \bar{L}} \widetilde{L}_{jt}},$$

where

$$\widetilde{L}_{jt} = \frac{1}{2} (L_{jt-1} + L_{jt})^{21}$$

and  $\bar{L}$  is an integer that stands for the firm size and defines large employers (i.e., if the firm size is greater than  $\bar{L}$ , the establishments that belong to such firms are categorized as those under large firms). Similarly, the growth rate of employment at all small employers  $g_t^{SMALL}$

<sup>16</sup> This is based on the data of the Employment Status Survey of 2007. Similar shares are obtained if I employ the data captured through the same survey in 2002.

<sup>17</sup> This is the average for the 1986–1998 period.

<sup>18</sup> I introduce these three classifications (i.e., small, medium, and large firms) to simplify the discussion that follows. There are several classification of firm sizes set forth by law. For example, the Small Medium Enterprises Basic Act sets the following criteria: “small and medium business entity” corresponds to those with fewer than 300 employees or less than JPY300 million in capital (manufacturing), fewer than 100 employees or less than JPY100 million (wholesale), fewer than 50 employees or less than JPY50 million (retail), and fewer than 100 employees or less than JPY50 million (service). In addition, the law defines a “small business entity” as one with fewer than 20 employees (manufacturing and other industries, except for commercial and service industries, where it has fewer than five employees).

<sup>19</sup> Moscarini and Postel-Vinay (2012) raise the point that when an economy grows, employers tend to grow in size with the economy and to jump into larger-sized “bins”; thus, greater job creation is attributed to larger size categories. This is the essence, they say, of “reclassification bias.”

<sup>20</sup> I will undertake in section 4 a parallel analysis for part-time regular workers, to discuss whether there is any substitution between full-time and part-time workers.

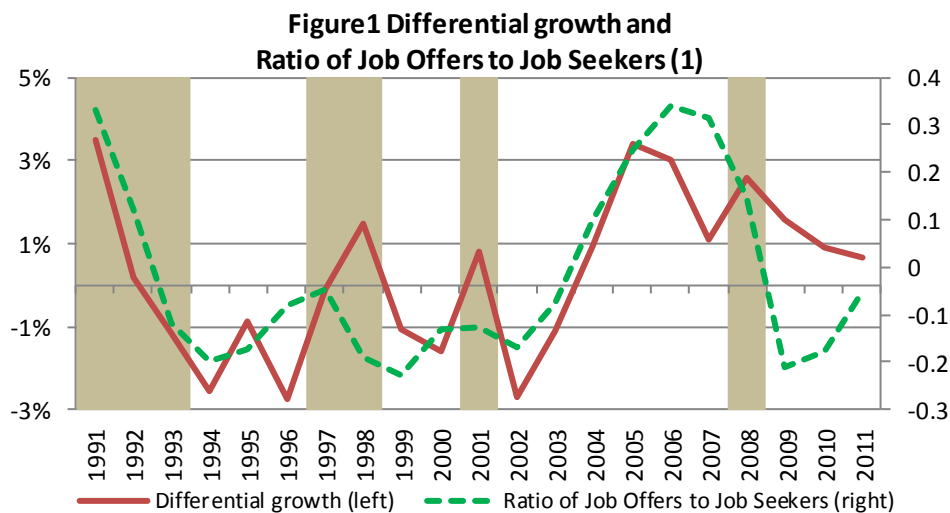
<sup>21</sup> Taking the average number of workers at the beginning and at the end as a denominator has the advantage of making the growth measure symmetric (Moscarini and Postel-Vinay, 2012).

is defined by using another threshold number,  $\underline{L}$ <sup>22</sup>.

My major interest is in the differential growth rates between large and small firms:

$$\Delta g_t = g_t^{LARGE} - g_t^{SMALL} \quad (1)$$

and in examining how this difference correlates with cyclical movements in the labor market. In this study, unlike most previous studies on job creation and destruction in Japan based on the Employment Trend Survey<sup>23</sup>, I calculate the number of jobs created and destroyed, as well as the net employment growth, on a biannual basis. However, in the final stage of my analysis, I estimate the difference in growth rates on an annual basis, because the change in employment shows a clear seasonal pattern that is not necessarily identical between large and small firms<sup>24</sup>. With regard to the index of cyclical movement in the labor market, I use the ratio of job offers to job-seekers of full-time work, detrended by a Hodrick–Prescott (HP) filter<sup>25</sup>.



Sources: (a) Differential growth: Employment Trend Survey (MHLW), (b) Ratio of job offers to job-seekers: Employment Referrals for General Workers (MHLW).

Note: Shaded areas are Cabinet Office (CAO) contractions; these areas are not precise, given the annual scale used here.

<sup>22</sup> For the establishment-based criteria, I use  $L_{jt-1}$  instead of  $F_{jt-1}$  to define “large” and “small” firms.

<sup>23</sup> For example, Terumayama and Genda (2001) select “one year” as a unit period to measure job creation and job destruction, because six months is too short of a period to exclude the impact of temporary changes in the number of workers from the creation or destruction of job opportunities.

<sup>24</sup> This limits the number of observations to 21 (1991–2011)—a sufficiently long period that covers 3.5 business cycles.

<sup>25</sup> Following Shimer (2012), I use a parameter at high frequency (8.1E6 at monthly frequency) and derive a detrended series on an annual basis. Given the limited number of observations for the differential-growth series, I do not apply the HP filter to this series; the graph indicates that there is no obvious trend therein.

Figure 1 shows a clear and positive correlation between differential growth and the ratio of job offers to job-seekers<sup>26</sup> (unconditional correlation: 0.675); this correlation is statistically significant ( $p$ -value: 0.0015). The differential grows in times of economic expansion and diminishes during economic downturns, although there are several exceptions (e.g., around the end of the 1990s and the beginning of the 2000s<sup>27</sup>, as well as in the years following the Lehman Brothers shock). In other words, large firms tend to create relatively more jobs when the economy is expanding, and tend to destroy more jobs when the economy is experiencing a recession. To check the robustness of this argument, I (i) employ on a supplementary basis the establishment-based criterion (results shown in Appendix Figure A-3), and (ii) calculate the differential growth between the largest firms and all the other firms (results shown in Appendix Figure A-4). With (i), the result appears to be quite similar to those seen in Figure 1; with (ii), compared to Figure 1, the correlation is lower (0.499), and significant only at the 5% level ( $p$ -value: 0.03). These findings are consistent with those of Moscarini and Postel-Vinay (2012) for not only the United States, but also European countries.

Figure 1 shows that the differential remained at a low level throughout almost all the 1990s, then became positive during the long economic expansion in the early 2000s. The differential has its local peak in the middle of recession, possibly because of a certain lag in the adjustment of job flows in correspondence with employment adjustment. Further, it should be noted that in Figure 1, after the most recent recession (2008–2009), the correlation between differential growth and market tightness is not evident. Although data for the most recent years (i.e., after 2012) are not available, at least until 2011, it seems that large employers had not increased their rates of net employment growth relative to that of small employers. During the most recent recession (March 2008–March 2009), the ratio of job offers to job-seekers dropped to a great extent. Meanwhile, the differential growth rate was adjusted more slowly and remained at a positive level, which might imply that at least by 2011, large firms were still in the process of gradually adjusting their workforces in the wake of the great shock of that recession.

### 3.2 Net Growth

By transforming the definition, the net growth rate can be expressed as follows<sup>28</sup>:

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<sup>26</sup> With regard to business cycles in Japan, the ratio of job offers to job-seekers tends to move in coincidence with the business cycle.

<sup>27</sup> For these periods, differential seems to be even acyclical because of possible lags in employment adjustment.

<sup>28</sup> This is an example of large firms, and a similar transformation is possible for small firms.

$$\begin{aligned}
g_t^{LARGE} &= \frac{\sum_{j:L_j > \bar{L}} (L_{jt} - L_{jt-1})}{\sum_{j:L_j > \bar{L}} \widetilde{L}_{jt}} \\
&= \frac{\sum_{i:L_i > \bar{L}, L_{it} \geq L_{it-1}} (L_{it} - L_{it-1}) - \sum_{k:L_k > \bar{L}, L_{kt} < L_{kt-1}} |L_{kt} - L_{kt-1}|}{\sum_{j:L_j > \bar{L}} \widetilde{L}_{jt}} \\
&= JCR_t^{LARGE} - JDR_t^{LARGE} \quad (2)
\end{aligned}$$

where *JCR* and *JDR* stand for “job-creation rate” and “job-destruction rate,” respectively.

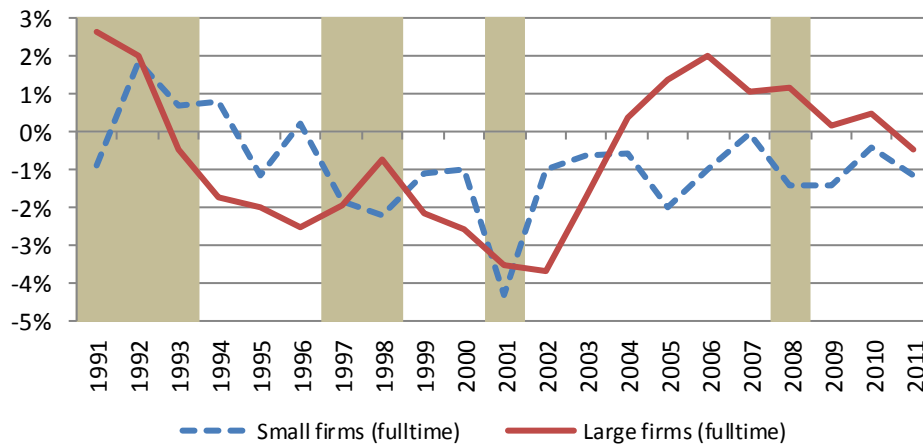
Figure 2 shows the trend in net growth rates, defined by differences in the job-creation and job-destruction rates. After the bursting of the economic bubble, the Japanese economy, including its labor market, experienced a period of sluggishness (often referred to as the “lost decade in Japan”<sup>29</sup>); this figure shows that from the early 1990s to the early 2000s, the net growth rates remained negative for large and small firms alike. During this period, it should be noted that the net growth rate of small firms remained higher than that of large firms. From the early 2000s, the Japanese economy entered a long-term expansionary period; from the very beginning of this period (i.e., in 2002), the net employment growth rate of small firms started to recover, followed by that of large firms. The net job-creation rate of large firms recovered quite rapidly and reached a positive level in 2004, surpassing the rate of small firms.

To be precise, the net employment growth rates of large employers do not tend to move in tandem with cyclical components, except in the case of the long expansionary period starting in 2002. Rather, they seem to move with a longer time span, possibly because of structural factors. On the other hand, net employment growth among small employers tends to drop soon after an economy enters a recession, and tends to recover rather quickly after a recession, but is not significantly linked to the business cycles. In general, net employment growth fluctuates more frequently at small firms than at large firms, but repeat modest increases and decreases. As a result, the extent of the volatility of the series measured by standard deviation is greater among large firms than among small firms.

The detrended ratio of job offers to job seekers (Appendix Figure A-2) stayed below its trend from the beginning of 1993 to the end of 2003, even during the expansionary period. This is consistent with the observation that the net employment growth rates remained negative among both small and large employers, particularly the latter.

<sup>29</sup> Teruyama and Genda (2010) argue that from the viewpoint of the macro-level labor market, the so-called lost decade corresponds to the years between 1992–1993 and 2002–2003.

**Figure2 Net employment growth rates (full-time workers)**



Source: Employment Trend Survey (MHLW).

Note: Shaded areas are CAO contractions; these areas are not precise, given the annual scale used here.

### 3.3 Job Creation and Job Destruction

To examine the trend in net employment growth differentials, by using equation (2), I decompose the change in the net employment growth into the change by gross job creation and the change by gross job destruction.

Appendix Figures A-5 and A-6 describe the trends in the gross job-creation and job-destruction rates by firm size. The correlations between the job-creation/job-destruction rates and the ratio of job offers to job-seekers are statistically significant for large firms (job-creation rate: 0.778,  $p$ -value: 0.000; job-destruction rate:  $-0.603$ ,  $p$ -value: 0.006), but neither of them is statistically significant for small firms<sup>30</sup>. In addition, the series of large firms shows greater volatility over the cycle than small firms; this implies that the strong correlation between the growth differential and the ratio of job offers to job-seekers stems mainly from the obvious correlation between the net employment growth of large firms and the ratio of job offers to job-seekers.

A clear decreasing trend is observed in the job-creation rates of small firms, but the nature of trends among large firms is rather ambiguous. The job-destruction rate of large firms exceeded 6% between 2000 and 2002. The job-destruction rates of small firms were higher than those of large firms throughout almost all of the 21-year period, with a level that was particularly high during the recession (1997–1998 and 2000–2002). Thereafter, the job-destruction rate continued to decline until 2004–2005 for large and small firms alike.

<sup>30</sup> In the case of small firms, the correlation with the job-creation rate is  $-0.130$  ( $p$ -value: 0.595); that with the job-destruction rate is  $-0.246$  ( $p$ -value: 0.311).

Around 2004, the job-creation rate was higher among small firms than among large firms. The job-creation rate of large firms reached its nadir in 1996, and remained at low levels until 2003.

### **3.4 Differential Gross Job Flows**

Figure 3 decomposes the differential net growth rate of existing firms into differential gross job-creation and differential gross job-destruction rates. Both differential rates are calculated based on detrended gross job-creation and job-destruction rates. In general, the differential job-creation rate is fairly procyclical (unconditional correlation: 0.661;  $p$ -value: 0.002), whereas the differential job-destruction rate does not clearly correlate with the cycles. From the early 1990s to the early 2000s, large firms continued to create fewer jobs than small firms, or a similar number—and often destroyed more jobs, too—irrespective of the business cycle phase. This pattern reversed around the mid-2000s; since then, large firms have created more jobs and often destroyed fewer jobs. However, after the 2008–2009 recession, the differential job-creation rate rapidly declined and became negative, while the differential job-destruction rate continued to rise until 2011.

I compare the trend of differential gross job flows with that of differential gross worker flows (Appendix Figure A-7). The differentials are calculated from the detrended worker accession and separation rates of large and small firms. By removing the obvious decreasing trend among worker mobility rates at small firms, the differential in worker accession remains almost constantly negative, while that in worker separation remains positive most of the time. Although the level remains negative, the former differential is fairly procyclical (unconditional correlation: 0.545;  $p$ -value: 0.016), whereas the latter differential does not seem to correlate with aggregate economic conditions. This result is consistent with the previous finding on the differential in job-creation and job-destruction rates.

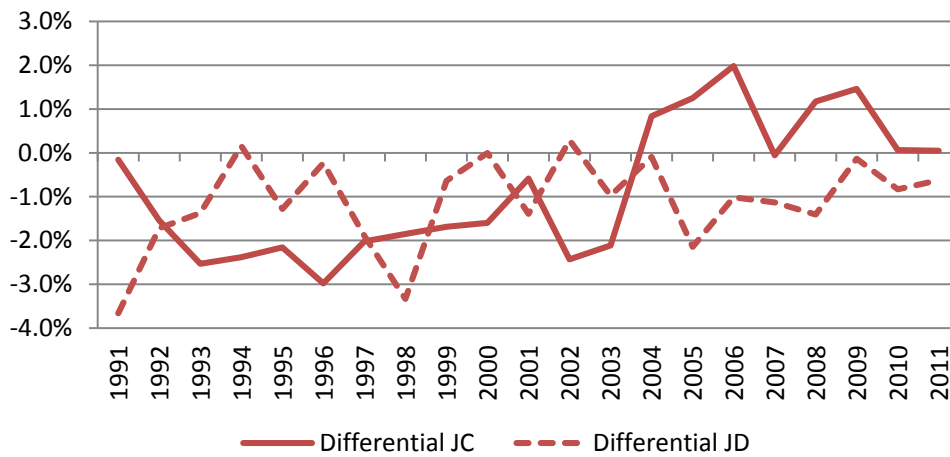
### **3.5 Substitution with Part-time Workers**

Why is the net employment growth rate at large firms more procyclical than at small firms? Can such procyclicality be explained by the same mechanism argued by Moscarini and Postel-Vinay (2008), or are there any other explanations? As one of such explanations, I infer that during recessions, large firms substituted their regular full-time workers with part-time workers to a greater extent than did small firms, and recovered them during expansions. Figure 4 shows trends in the net employment growth rates of part-time workers, among small and large firms; it indicates quite obviously that the net growth rate of part-time workers was not necessarily higher among large firms than among small firms during the corresponding period. Furthermore, the differential growth rate of full-time workers does not correlate with that of part-time workers, with statistical significance (correlation: 0.081;  $p$ -value: 0.741).

Therefore, my first hypothesis does not seem to answer the above question.

Another possibility is that stronger procyclicality of the hires of new graduates at large firms than at small firms. As I cannot directly observe the number of the hires of new graduates from the Employment Trend Survey, this issue is left for future work.

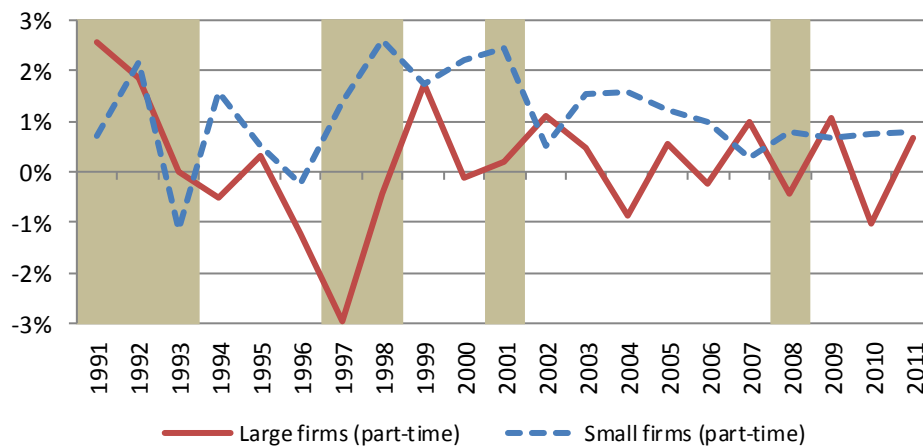
**Figure 3 Differential gross job flows (full-time workers)**



Source: Employment Trend Survey (MHLW).

Note: JC: job creation; JD: job destruction.

**Figure 4 Net employment growth rates (part-time workers)**



Source: Employment Trend Survey (MHLW).

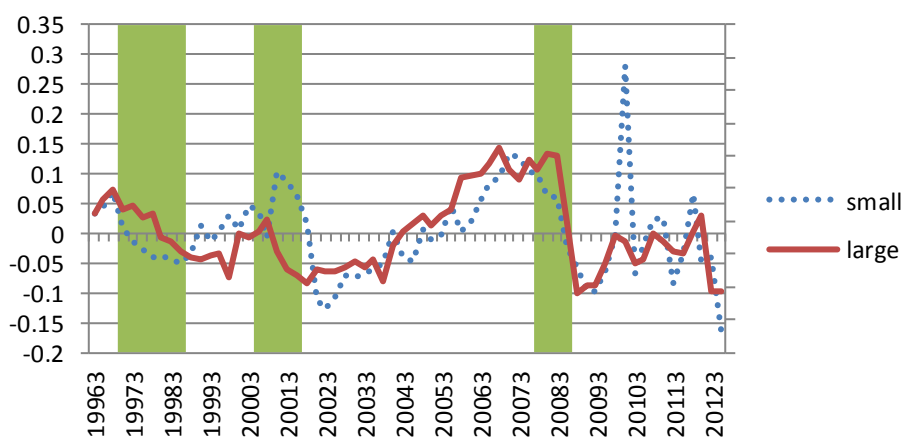
Note: Shaded areas are CAO contractions; these areas are not precise, given the annual scale used here.

### 3.6 Cyclical Components of Sales and Employment by Firm Size

Thus far, I have shown that cyclical behavior in terms of net employment growth is more

obvious among large firms than among small firms in Japan in the 1990s and 2000s. As discussed by Gertler and Gilchrist (1994), the US evidence up to then provided proof that small firms account for a significantly disproportionate share of the manufacturing decline that typically follows a tightening of monetary policy. Contrary to their discussion, I argue that the net employment growth in Japan is more cyclically sensitive among large employers than among small ones. To examine the consistency of this argument in view of the discussion by Gertler and Gilchrist (1994), I calculate the cyclical components of sales made by large and small firms<sup>31</sup> (Figure 6), following a methodology seen in the literature (e.g., Chari, Christiano, and Kehoe, 2007). Although Gertler and Gilchrist focus on contractionary monetary policy shocks, I alternatively investigate the impact of business cycle contraction, which is easier to identify. As the series of the cumulative sum of log-differenced sales data for both large and small firms show a clear trend (particularly for small firms) (Appendix Figure A-10), I detrended them by using the HP filter to derive the cyclical components. The results indicate that the decline among small firms in 2001 and 2011–2012 seems to be greater than that among large firms, but the volatility of the series is similar, save for these periods and the case of an outlier<sup>32</sup>. Therefore, it is not very straightforward to link the difference in the volatility of sales to that in the volatility of employment at various firm-size levels.

**Figure 5 Cyclical components of sales by firm size**



Source: Financial Statements Statistics of Corporations by Industry (Ministry of Finance).

Note: Shaded areas are CAO contractions on a quarterly basis.

<sup>31</sup> The data source of sales data is Financial Statements Statistics of Corporations by Industry, published by Japan’s Ministry of Finance. I note that given certain data constraints, the categories of “large” and “small” firms differ from those used in the main part of my discussion. Here “large firms” corresponds to those with capital greater than JPY100 million, and “small firms” to those with capital of JPY10–50 million. Given that they are not easily compared, I need to be careful in interpreting the results.

<sup>32</sup> The observation of the second quarter of 2010 for small firms seems to be an outlier.



## 4. Estimation Results

### 4.1 Job Reallocation and Labor Mobility

In this section, I undertake an empirical analysis of job reallocation and labor mobility, using a micro-level dataset captured through the Employment Trend Survey. In detail, following the analysis of Gielen and van Ours (2006), I estimate a quasi-panel model at an industry level (baseline model) that explains job and worker turnover:

$$y_{it} = \alpha_i^y + \beta_n^y CC_t + \varepsilon_{it}^y, \quad (\text{A})$$

where the dependent variables ( $y_{it}$ ) are the job-creation rate (1), the job-destruction rate (2), the worker accession rate (3), and the worker separation rate (4) for industry  $i$  and time  $t$ . I estimate a fixed-effects model where  $\alpha_i^y$  refers to the fixed effects for industry classification.  $CC_t$  represents the cyclical components of the aggregate labor market; more precisely,  $\Delta e_{nt}$  represents employment growth at the national level: “vacancy–unemployment (v–u) ratio” is the ratio of vacancies to the unemployed in the market, “unemployment rate (+1)” corresponds to the lead unemployment rate by one period<sup>33</sup>, and “tankan” is a business sentiment index regarding the future prospect of the business condition for each individual firm in the upcoming quarter<sup>34</sup>. V-u ratio and unemployment rate are monthly series, thus first detrended by the HP filter and converted at a biannual basis<sup>35</sup>. Finally,  $\beta_n$  measures the effect of the cycle, as the above indicators co-move with the cyclical pattern.

The estimation results of this model are represented in the upper part of Table 1 (A. Baseline model). The cyclical pattern at the aggregate level positively affects both worker accessions and job creation (more worker inflow and job creation during an economic upturn), while it negatively affects both worker separations and job destruction (lower worker outflow and job destruction during an economic upturn). These results are consistent with various cyclical indicators (i.e., net employment growth, market tightness, and unemployment rate); worker mobility and job turnover appears to respond to aggregate economic change at the national level. By comparing the magnitudes of the effects, net worker inflow<sup>36</sup> (difference between worker accessions and worker separations) appears to behave procyclically, and this finding is consistent with my discussion in the previous section on large firms.

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<sup>33</sup> I employ a lead variable, as the unemployment rate is a lagged indicator of aggregate labor market conditions.

<sup>34</sup> I employ Tankan indicator by three industry categories (i.e. industry producing materials, processing and assembly industry, and non-manufacturing industry) to which each establishment belong.

<sup>35</sup> Tankan (a quarterly series) is also converted at a biannual basis.

<sup>36</sup> By definition, the net employment growth equals not only the difference between job creation and job destruction, but also the difference between worker accession and worker separation.

**Table 1 Size-specific effects of cyclical factors on job reallocation and worker mobility (full-time workers) (1)**

	Job creation				Job destruction			
a. Baseline model								
Cyclical components of labor market (A)								
$\Delta e_n$	0.459 ***				-0.414 ***			
	(0.111)				(0.095)			
v-u ratio		0.035 **				-0.043 ***		
		(0.017)				(0.014)		
unemployment rate(+1)			-0.012 **				0.019 ***	
			(0.005)				(0.004)	
tankan				2.8.E-05				-2.1.E-04
				(0.000)				(0.000)
R-sq	0.202	0.186	0.207	0.022	0.222	0.211	0.236	0.006
b. Size-effects model (A)								
$\Delta e_n$	0.497 ***				-0.704 ***			
	(0.090)				(0.100)			
v-u ratio		0.034 **				-0.019 ***		
		(0.014)				(0.004)		
unemployment rate(+1)			-0.008 ***				0.017 ***	
			(0.002)				(0.003)	
tankan				2.0.E-04 ***				-1.9.E-04 ***
				(0.000)				(0.000)
Interaction terms between (A) and size dummies								
1000+	-	-	0.007 **	-	-	-	-0.012 ***	-
			(0.003)				(0.003)	
300-999	-0.017	-0.023	0.006 ***	-1.4.E-04 **	0.021	0.003	-0.011 ***	2.2.E-05
	(0.100)	(0.015)	(0.002)	(0.000)	(0.106)	(0.007)	(0.003)	(0.000)
100-299	-0.018	-0.030 **	0.004 **	-8.7.E-05	0.166	0.004	-0.013 ***	2.1.E-04 ***
	(0.100)	(0.015)	(0.002)	(0.000)	(0.109)	(0.008)	(0.003)	(0.000)
30-99	-0.135	-0.030 **	0.006 ***	-2.0.E-04 **	0.219 **	0.000	-0.014 ***	1.2.E-04 **
	(0.104)	(0.015)	(0.002)	(0.000)	(0.094)	(0.006)	(0.003)	(0.000)
5-29	-0.033	-0.036 **	0.005 **	-1.8.E-04 **	0.154	-0.012	-0.014 ***	4.3.E-05
	(0.126)	(0.015)	(0.002)	(0.000)	(0.108)	(0.007)	(0.003)	(0.000)
R-sq	0.114	0.114	0.113	0.110	0.105	0.102	0.102	0.092

	Worker accessions				Worker separations			
a. Baseline model								
Cyclical components of labor market (A)								
$\Delta e_n$	0.656 ***				-0.216			
	(0.182)				(0.149)			
v-u ratio		0.060 **				-0.017		
		(0.027)				(0.022)		
unemployment rate(+1)			-0.017 **				0.014 **	
			(0.008)				(0.006)	
tankan				2.7.E-05				-2.1.E-04
				(0.000)				(0.000)
R-sq	0.278	0.272	0.277	0.039	0.140	0.139	0.137	0.030
b. Size-effects model								
(A)								
$\Delta e_n$	0.778 ***				-0.361 ***			
	(0.148)				(0.138)			
v-u ratio		0.030 **				-0.022 ***		
		(0.015)				(0.007)		
unemployment rate(+1)			-0.001				0.023 ***	
			(0.003)				(0.004)	
tankan				2.9.E-04 ***				-8.2.E-05
				(0.000)				(0.000)
Interaction terms between (A) and size dummies								
1000+	-	-	0.0021	-	-	-	-0.016 ***	-
			(0.004)				(0.004)	
300-999	0.026	-0.0289 *	-0.0026	-9.7.E-05	-0.0213	-0.004	-0.019 ***	4.5.E-05
	(0.165)	(0.017)	(0.003)	(0.000)	(0.149)	(0.011)	(0.004)	(0.000)
100-299	-0.082	-0.0257	-0.0032	-5.1.E-05	0.00745	0.006	-0.020 ***	2.0.E-04 **
	(0.160)	(0.017)	(0.003)	(0.000)	(0.151)	(0.012)	(0.004)	(0.000)
30-99	-0.265 *	-0.0202	-0.0015	-2.4.E-04 ***	0.0082	0.009	-0.020 ***	6.6.E-05
	(0.156)	(0.016)	(0.003)	(0.000)	(0.133)	(0.010)	(0.004)	(0.000)
5-29	-0.293	-0.0356 **	-0.0032	-2.0.E-04 *	-0.1924	-0.013	-0.021 ***	1.7.E-05
	(0.185)	(0.018)	(0.003)	(0.000)	(0.152)	(0.012)	(0.004)	(0.000)
R-sq	0.281	0.275	0.275	0.279	0.191	0.197	0.189	0.188

Note: The estimates are based on 626 observations in model A (baseline model) and 3,062 in model B (size-effects model). Robust standard errors are shown in parentheses; \*\*\*/\*\*/\* indicates that the coefficient is different from zero at the 1/5/10% level of significance. Detrended series are used for the estimation with regard to labor market tightness and the unemployment rate. All analyses include dummies for survey month and quadratic terms of time trend, as well as controls for fixed effects of industries.

## 4.2 Size-specific Job Reallocation and Worker Mobility

I turn now to the firm-size specific effects of job reallocation and worker mobility. I re-estimate equation (A) to investigate whether marginal responses of job and worker turnover to cyclical factors vary by firm size. Now  $y_{its}$  is the dependent variable, where  $i$  stands for industry and  $s$  denotes the size category<sup>37</sup>. I include interaction terms between firm sizes and cyclical factors of the aggregate labor market ( $CC_t$ ). For the estimation of this part, I limit the sample to those records that belong to certain industries and that contain a

<sup>37</sup> As shown in Table 1,  $s=1$  corresponds to the firms with more than 1,000 employees, 2 with 300-999 employees, 3 with 100-299 employees, 4 with 30-99 employees, and 5 with 5-29 employees.

sufficient number of observations<sup>38</sup>. The estimation results are included in the lower part of Table 1 (B. Size effects model). If the coefficients of the interaction terms are estimated with statistical significance, this would suggest that conditional on the business cycle, there are firm-size-specific differences. For any of the four explained variables, there are results that indicate that large firms' job reallocation or worker mobility can be more procyclical than that of small firms. However, these findings are not necessarily robust, as other estimation patterns show the opposite results (i.e., small firms are more procyclical), or some results are estimated as not having statistical significance.

As explained in section 2, I can only construct short establishment panels in a piece-wise manner during the 21-year time span of the available dataset. By using these panel datasets, I execute a supplementary analysis on job reallocation and worker mobility, based on the estimation of the following OLS with the interaction terms between establishment dummies and cyclical components:

$$y_{jt} = \alpha^y + \beta_n^y CC_t + \beta_{nj}^y CC_t * est\_dummy_j + \gamma^y x_{jt} + \varepsilon_{it}^y, \quad (B)$$

where  $y_{jt}$  is the same as the specification of (A), but at an establishment level;  $\alpha^y$  is a constant term;  $CC_t$  is the cyclical components of the aggregate labor market;  $est\_dummy_j$  stands for dummies of the individual establishment  $j$ ;  $x_{jt}$  is the time-variant attributes of establishment  $j$ ; and  $\beta_n^y$  measures the effect of the cycle, which is establishment-specific if  $\beta_{nj}^y$  is estimated with statistical significance<sup>39</sup>. I further include dummies of survey timing, to control for seasonal factors.

Table 2 summarizes the summary statistics of the estimated coefficients of (B) (i.e.  $\beta_n^y + \beta_{nj}^y$ ) by firm size of the first panel (years 1993–1995). The rest of the results are included in the Appendix (Table A-4). I note that for the first panel, the economy was in a contraction period in the first year, bottomed out in October 1993, and was in an expansionary period thereafter; for the second panel (years 2006–2008), the economy was in the final stage of a long expansionary period, then entered a severe recession from February 2008; for the third panel (years 2009–2011), the economy bottomed out in March 2009 and was in expansion thereafter. As indicators of cyclical components, I employ the same set of indicators used in a previous estimation (A).

<sup>38</sup> Concretely, I employ samples from 15 industries, each with more than 5,000 observations in the entire dataset.

<sup>39</sup> In Table 2, I include the information of coefficients that are not estimated with statistical significance to derive summary statistics of the estimated coefficients for each establishment  $j$  (i.e.  $\beta_n^y + \beta_{nj}^y$ ), categorized by firm size to which establishment is affiliated.

With regard to the estimation results of Table 2, they are mostly consistent with the expected results: the distribution of the derived coefficients indicates that job reallocation and worker mobility tend to be more procyclical at large firms than at small firms<sup>40</sup>. The standard deviation of the estimated coefficients tends to be greater at small firms, so that they tend to have longer tails at both ends. However, the mean, median, or quartile points of the coefficients indicate that establishments affiliated to large firms tend to show greater marginal responses evaluated by their absolute levels. The estimation results with the second and third panels are more obscure, possibly because of the limited sample size and insufficient observations of small firms. The results of the third panel (years 2009-2011) seem to indicate that the coefficients of job creation rate and worker accession rate tend to have opposite sign as expected. Such tendency is consistent with my previous findings at a macro level on the trends of the differential net employment growth after the recession around the Lehman shock (Figure 1).

**Table 2 Size-specific effects of cyclical factors on job reallocation and worker mobility (full-time workers) (2)**

[Panel 1]

(1) Job creation

Firm size	mean	sd	min	max	p25	p50	p75	N
1000+	0.027	0.045	-0.027	0.511	0.000	0.015	0.038	1,141
300-999	0.014	0.043	-0.026	0.453	-0.006	0.003	0.020	459
100-299	0.012	0.042	-0.027	0.420	-0.014	0.002	0.022	407
30-99	0.023	0.071	-0.027	0.594	-0.015	0.004	0.033	461
5-29	0.029	0.098	-0.027	0.841	-0.025	-0.022	0.057	557
Total	0.023	0.062	-0.027	0.841	-0.009	0.008	0.034	3,025

(2) Job destruction

Firm size	mean	sd	min	max	p25	p50	p75	N
1000+	-0.054	0.078	-0.689	0.575	-0.077	-0.057	-0.034	1,141
300-999	-0.026	0.069	-0.094	0.624	-0.056	-0.043	-0.021	459
100-299	-0.019	0.049	-0.067	0.346	-0.047	-0.033	-0.014	407
30-99	-0.004	0.072	-0.062	0.545	-0.042	-0.024	0.008	461
5-29	0.004	0.102	-0.062	0.721	-0.055	-0.039	0.030	557
Total	-0.027	0.081	-0.689	0.721	-0.059	-0.043	-0.012	3,025

(3) Worker accessions

Firm size	mean	sd	min	max	p25	p50	p75	N
1000+	0.053	0.078	-0.068	0.738	0.004	0.033	0.076	1,141
300-999	0.026	0.093	-0.072	1.490	-0.016	0.007	0.037	459
100-299	0.025	0.075	-0.076	0.468	-0.019	0.009	0.049	407
30-99	0.039	0.112	-0.076	0.980	-0.024	0.012	0.062	461
5-29	0.034	0.136	-0.076	1.251	-0.062	0.002	0.080	557
Total	0.040	0.099	-0.076	1.490	-0.014	0.018	0.065	3,025

<sup>40</sup> These results are those when I employ national labor market tightness as a cyclical indicator. The estimation results with other indicators including prefectural market tightness or unemployment rate are quite unstable and are hard to interpret.

(4) Worker separations

Firm size	mean	sd	min	max	p25	p50	p75	N
1000+	-0.028	0.084	-0.462	0.638	-0.071	-0.046	-0.005	1,141
300-999	-0.014	0.094	-0.107	0.974	-0.061	-0.035	-0.001	459
100-299	-0.006	0.076	-0.110	0.558	-0.049	-0.024	0.010	407
30-99	0.012	0.110	-0.110	0.748	-0.046	-0.016	0.031	461
5-29	0.010	0.137	-0.110	0.846	-0.087	-0.025	0.058	557
Total	-0.010	0.102	-0.462	0.974	-0.064	-0.033	0.012	3,025

Note: Control variables include the total number of workers per establishment, and a dummy for survey timing (i.e., June survey or December survey).

### 4.3 Part-time and Full-time Workers

Table 3 describes the corresponding estimation results of (A) with regard to part-time workers. I look to examine the plausibility of the hypothesis regarding possible substitution effects, as discussed in subsection 3.5. My tentative conclusion in that subsection was that no substitution effects between full-time and part-time regular workers exist at the macro level by firm size. I check this hypothesis, based on the micro-level dataset. The first thing to be noted is that most cyclical measures of the aggregate labor market do not have an obvious relationship, particularly with job creation or worker accession. The exception is an unemployment rate, which reveals to be positively linked to both job creation and worker accession of part-timers. In contrast, both job destruction and worker separation are clearly linked with cyclical factors, with signs that are both expected and consistent with those of full-time workers. However, size-specific effect cannot be clearly detected with regard to job creation or destruction, while both worker accession and separation of large firms tend to be more responsive to the changes in the unemployment rate than that of small firms. In summary, I infer that there is some evidence supporting the assertion that firms create and destroy jobs of part-time workers to a greater extent in correspondence with higher unemployment rate. Further, there is some evidence that large firms tend to have more procyclical worker mobility rates, which is quite particular with the development of the unemployment rate.

**Table 3 Size-specific effects of cyclical factors on job reallocation and worker mobility (part-time workers)**

	Job creation				Job destruction			
a. Baseline model								
Cyclical components of labor market (A)								
$\Delta e_n$	0.433 (1.004)				-1.351 *** (0.401)			
v-u ratio		0.027 (0.037)				-0.064 *** (0.019)		
unemployment rate(+1)			0.017 *** (0.006)				0.026 *** (0.008)	
tankan				2.9.E-04 (0.000)				-7.8.E-04 ** (0.000)
R-sq	0.022	0.024	0.026	0.024	0.018	0.030	0.039	0.038
b. Size-effects model								
(A)								
$\Delta e_n$	-0.598 (0.370)				-0.071 (0.421)			
v-u ratio		0.000 (0.027)				-0.038 ** (0.017)		
unemployment rate(+1)			-				-	
tankan				-5.4.E-05 (0.000)				-7.2.E-04 *** (0.000)
Interaction terms between (A) and size dummies								
1000+	-	0.010 (0.029)	0.017 *** (0.004)	3.0.E-04 (0.000)	-	0.022 (0.029)	0.018 *** (0.005)	2.3.E-04 (0.000)
300-999	0.157 (0.579)	-0.022 (0.034)	0.018 *** (0.005)	-	-0.628 (0.420)	-0.027 (0.026)	0.019 *** (0.005)	-
100-299	0.244 (0.321)	0.011 (0.030)	0.016 *** (0.004)	3.1.E-04 (0.000)	-0.805 ** (0.374)	-0.023 (0.027)	0.019 *** (0.005)	1.0.E-04 (0.000)
30-99	-0.013 (0.336)	-0.005 (0.029)	0.017 *** (0.004)	-7.7.E-05 (0.000)	-1.248 *** (0.419)	-0.017 (0.023)	0.019 *** (0.005)	2.5.E-04 (0.000)
5-29	0.774 (0.648)	-	0.016 *** (0.004)	2.3.E-04 (0.000)	-1.085 *** (0.356)	-	0.015 *** (0.005)	6.6.E-04 (0.000)
R-sq	0.022	0.021	0.025	0.022	0.017	0.019	0.025	0.022

	Worker accessions				Worker separations			
a. Baseline model								
Cyclical components of labor market (A)								
$\Delta e_n$	0.451 (1.167)				-1.333 *** (0.429)			
v-u ratio		0.035 (0.045)				-0.056 ** (0.025)		
unemployment rate(+1)			0.019 ** (0.007)				0.027 ** (0.011)	
tankan				4.3.E-04 (0.000)				-6.4.E-04 * (0.000)
R-sq	0.039	0.042	0.039	0.043	0.036	0.039	0.052	0.041
b. Size-effects model								
(A)								
$\Delta e_n$	-1.209 ** (0.480)				-0.682 (0.471)			
v-u ratio		0.010 (0.032)				-0.029 (0.023)		
unemployment rate(+1)								
tankan				-1.0.E-04 (0.000)				-7.7.E-04 *** (0.000)
Interaction terms between (A) and size dummies								
1000+	-	0.010 (0.039)	0.025 *** (0.005)	4.5.E-04 (0.000)	-	0.021 (0.037)	0.026 *** (0.006)	3.8.E-04 (0.000)
300-999	0.932 (0.689)	-0.062 (0.041)	0.023 *** (0.006)	-	0.147 (0.573)	-0.067 * (0.034)	0.025 *** (0.005)	-
100-299	0.811 * (0.459)	0.011 (0.037)	0.020 *** (0.005)	6.4.E-04 * (0.000)	-0.238 (0.445)	-0.023 (0.034)	0.023 *** (0.005)	4.3.E-04 (0.000)
30-99	0.702 (0.480)	-0.016 (0.039)	0.020 *** (0.005)	2.7.E-04 (0.000)	-0.532 (0.492)	-0.028 (0.031)	0.021 *** (0.005)	5.9.E-04 ** (0.000)
5-29	1.557 ** (0.705)	-	0.015 *** (0.005)	1.0.E-03 *** (0.000)	-0.302 (0.449)	-	0.013 ** (0.005)	1.4.E-03 *** (0.000)
R-sq	0.067	0.066	0.080	0.072	0.042	0.046	0.072	0.051

Note: The estimates are based on 609 observations in model A and 3020 in model B. Robust standard errors are shown in parentheses; \*\*\*/\*\*/\* indicates that the coefficient is different from zero at the 1/5/10% level of significance. Detrended series are used for the estimation with regard to labor market tightness and the unemployment rate. All analyses include dummies for month and quadratic terms of time trend as well as controls for fixed effects of industries.

## 5. Change of wages in job reallocation by firm size

### 5.1 Procyclicality of wage changes at the time of job changes

In this section, I examine the wage levels of job-changers by firm size, under various business cycle phases. Moscarini and Postel-Vinay (2009) argue that during an expansion, as the labor market tightens, more-productive firms start to increase their wages to acquire workers from less-productive competitors; thus, workers “upgrade” by quitting to higher-paying employers. Their theory predicts that large firms grow in size faster than small ones when the labor market is tight, while small firms grow faster in a slack labor market. At the same time, it predicts that the growth rate of real wages is above its trend in a tight labor market and below its trend in a slack one. Together, it implies that the correlation between



wage growth and employment growth should be positive at large firms, whereas the correlation can be unclear at small firms.

In Japan's labor market, at an early stage of expansion, firms start to create new vacancies, the level of which is considered to be a leading indicator. Workers start to be matched to vacancies either from the unemployment pool or from other firms via job-to-job transition, thus the ratio of vacancies to the unemployed rises gradually in expansionary periods (coincident indicator to the business cycles). The unemployment pool has been fueled by workers who were in non-labor force, but towards the end of the expansion, unemployment rate starts to increase (lagged indicator to the business cycles). During this process, all firms are likely to raise wage offers, while I predict that the offers of large firms should be more procyclical than the others, as their opportunity costs for not filling in vacancies are higher than small firms because of higher productivity level.

To examine whether this argument is consistent with the empirical evidence of the Japanese labor market, I first summarize the aggregate situation of wage changes among job-changers by using Employment Trend Survey data.

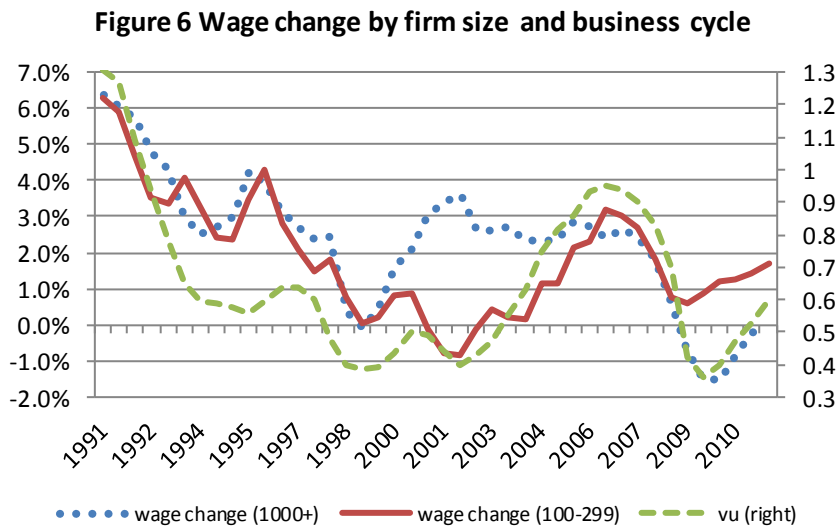
Figure 6 shows the average level of wage change by firm size, among all full-time workers who made a job-to-job transition. To avoid the discrepancy between the timing of job transition and cycles, I limit the sample to those who secured a new position within one month of initiating a job search. The two lines in the figure correspond to the average wage change among large firms and among medium firms. Interestingly, the average wage change among medium firms more closely correlates with the cyclical components than that of large firms (correlation with  $v-u$  ratio is 0.77 and 0.66, respectively). The same result holds with regard to the correlation with aggregate unemployment rate ( $-0.88$  and  $-0.59$ , respectively). Wage changes at job transition into small firms do not show any significant correlations with the cycles<sup>41</sup>, which implies that medium firms are the ones to provide the most pro-cyclical wage changes to workers who actually started a new job at them. I also derive quite consistent results from the estimation at an establishment level<sup>42</sup> (correlation with the  $v-u$  ratio is 0.61 for establishments affiliated to medium firms and 0.21 for establishments affiliated to large firms, and that with the unemployment rate is  $-0.77$  and  $-0.57$ , respectively). With regard to the pro-cyclicality of wage offers at large firms it is obvious except for the first half of the 2000s when the economy was expanding, while wage change at large firms remained almost stable. As I have discussed in previous sections, this might have been caused by the structural factors of large firms. Theory predicts that this positive correlation arises through job upgrading: a transition from low-productivity (i.e., small) firms

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<sup>41</sup> The correlation with labor market tightness is almost 0 (0.026) and not significant.

<sup>42</sup> In this case, I calculate the average wage change per establishment and derive the average of these changes by firm size.

to high-productivity (i.e., large) firms during expansion. However, the link between such upgrading in firm sizes and cycles is difficult to identify with regard to large firms, even after controlling for the trend effect; meanwhile, no obvious relationship is detected in the case of medium firms (Appendix Figure A-11). Indeed, notwithstanding the phases of business cycles, the majority of new entrants at large firms come from large firms as well, while medium firms accept workers from varied size of firms. Because I only observe the change in wages, not the wage levels themselves, I cannot examine whether this pro-cyclicality of wage changes is caused by the trend of wage offers of new jobs or the wage levels of previous jobs. To summarize, the procyclicality of wage changes seem to be clear at medium and large firms. Wage changes are the most responsive to the aggregate labor market at medium firms, while they are also clearly linked to it at large firms, except for the first half of the 2000s.



Source: Employment Trend Survey (MHLW)

Note: The wage change series is the moving average of three terms of the original series.

## 5.2 Procyclicality of wage offers at the time of job changes

Next I use wage level data of the job-changers from the BSWS to test the hypothesis on wage levels discussed in the previous sub-section. By assuming that the cyclical components of the labor market affect the entrants' wage levels to a varied extent depending on firm size, I include a cyclical factor and its interaction terms with firm-size dummies to estimate the wage function of job-changers upon entering a new firm. In the formulation of such a wage function, I consult the literature that takes into account the impact of the unemployment rate based on the implicit contract model (Beaudry and DiNardo, 1991)<sup>43</sup>. In line with that model, the wage function I estimate is as follows:

<sup>43</sup> I note that Beaudry and DiNardo (1991) formulated a wage equation that contains the previous development of unemployment based on an implicit contract model. On the other hand, my specification is instead based on what they call a

$$\ln w_{it}^j = X_{it}^j \Omega_1 + \Omega_2 CC_t + \Omega_3 CC_t * firm\_size_j + \varepsilon_{it} \quad (C)$$

That is, the wage in period  $t$  for an individual  $i$  who started the job in period  $t$  at firm  $j$  is a function of his or her individual characteristics, as well as the firm's characteristics  $X_{it}^j$ , at period  $t$ ; the aggregate labor market conditions summarized either by the v–u ratio, growth rate of new vacancies<sup>44</sup>, or by the unemployment rate  $CC_t$ ; the interaction terms between the labor market conditions and firm-size dummies; and an error term  $\varepsilon_{it}$ . The vector of controls,  $X$ , includes age and squared age (proxy of general skill level), experience and squared experience of a current job (proxy of specific skill level), education level, gender, and establishment size. Industry dummies and dummies of the location of the establishments (i.e. prefectural dummies<sup>45</sup>) are also included in the estimation.

**Table 4 Wage cyclicality of job-changers by firm size (1)**

Cyclical component of labor market (x)	Without taking into account overtime			Taking into account overtime		
	(1) (v/u)	(2) $\Delta$ new_v	(3) UE	(4) (v/u)	(5) $\Delta$ new_v	(6) UE
x	-0.1153 *** (0.003)	0.0421 *** (0.012)	-0.0403 *** (0.001)	-0.1129 *** (0.003)	0.0475 *** (0.012)	-0.0475 *** (0.001)
Interaction terms with x and firm-size dummies						
5000+	0.1924 *** (0.003)	-0.0614 *** (0.016)	0.0372 *** (0.001)	0.2130 *** (0.003)	-0.0689 *** (0.015)	0.0428 *** (0.001)
1000-4999	0.1883 *** (0.001)	-0.0687 *** (0.016)	0.0357 *** (0.001)	0.1996 *** (0.003)	-0.0787 *** (0.016)	0.0382 *** (0.001)
500-999	0.1813 *** (0.003)	-	0.0339 *** (0.001)	0.1950 *** (0.003)	-	0.0369 *** (0.001)
300-499	0.1447 *** (0.003)	-0.0519 *** (0.016)	0.0279 *** (0.001)	0.1751 *** (0.003)	-0.0566 *** (0.016)	0.0341 *** (0.001)
100-299	0.1006 *** (0.003)	-0.0645 *** (0.013)	0.0193 *** (0.001)	0.1327 *** (0.003)	-0.0662 *** (0.013)	0.0255 *** (0.001)
30-99	0.0684 *** (0.003)	-0.0572 *** (0.012)	0.0139 *** (0.000)	0.0913 *** (0.003)	-0.0623 *** (0.012)	0.0184 *** (0.000)
10-29	0.0430 *** (0.003)	-0.0527 *** (0.012)	0.0083 *** (0.000)	0.0478 *** (0.003)	-0.0583 *** (0.012)	0.0096 *** (0.000)
5-9	- -	-0.0523 *** (0.013)	- -	- -	-0.0587 *** (0.013)	- -
N	512,207	330,772	512,207	512,207	330,772	512,207
Adjusted R-sq	0.383	0.386	0.384	0.458	0.402	0.460
Estimation period	1991-2012	1997-2012	1991-2012	1991-2012	1997-2012	1991-2012

spot-market model, where current wages relate only to contemporaneous market conditions.

<sup>44</sup> New vacancies are the ones created by firms of the same size as that of firm  $j$ .

<sup>45</sup> Prefectural dummies are not included in the estimations with v-u ratio by prefectures.

Note: Explained variable = $\ln(\text{wage})$ . Wages are on an hourly basis, and deflated by CPI. In models (1)-(3), work hours are on a contractual basis, while they reflect both contractual and overtime hours in models (4)-(6). X is labor market tightness (models 1 and 4), the growth rate of new vacancies by firm size (models 2 and 5), or unemployment rate (models 3 and 6). Estimation period is shorter in models (2) and (5) because of data availability. Quadratic terms of time trend are included in the regression. Other control variables include age, squared age, educational level, sex, years of experience in the same kind of job, squared years of the experience, industry dummies, and establishment size (number of employees). The index of cyclical component of labor market corresponds to the period between April and June of the survey year. Robust standard errors are in parentheses, \*\*\*, \*\*, \* corresponds to significance level at 1%, 5%, 10%, respectively.

In all models of Table 4, I use logarithmic value of real wages per hour as an explained variable, and v-u ratio, growth rate of new vacancies or unemployment rate as variables that stand for cyclical components of labor market, and include a quadratic time trend in the regression. As previous literature pointed out the importance of the choice of wage measures to identify pro-cyclicality of real wages (Anger, 2011), I employ two different measures in this estimation; one is a “standard hourly wage” defined as pay per contractual working hour (models 1-3), the other is an “effective wage” calculated by averaging total earnings (including overtime allowance but excluding bonus) over all working hours (models 4-6).

Table 4 provides clear evidence with regard to the cyclicity of wage offers made for job changers<sup>46</sup>. From models 1 and 4 of Table 4, it is indicated that the pro-cyclicality of wages is stronger at larger firms, while clear link with the business cycles are not observed among small firms (i.e. less than 29 employees) or their wages are even acyclical. The strong procyclicality of wages among large and medium-sized firms is consistent with my previous findings of wage changes over job transition (Figure 6), which is based on different statistics. In addition, I derive almost consistent results when I employ labor market tightness of a prefecture where each establishment is located as an indicator of the economic conditions (Table 5). I note that pro-cyclicality is equally strong at large and medium firms (i.e. with more than 500 employees) and diminishes as firm size becomes smaller in models 7 and 8. Furthermore, when I control the growth of the demand that is newly created, employing the growth rate of new vacancies as a cyclical component of the economy (models 2 and 5), the coefficients of large and small firms (i.e. with more than 1000 employees and with less than 100 employees, respectively) are estimated as negative. Only the coefficients of medium firms (i.e. with 300-999 workers) are estimated to be positive with regard to the standard

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<sup>46</sup> As this dataset contains non-negligible proportion of part-time workers, I limit the samples to those who worked more than 18 days per month, and worked longer than 7 hours per day on average, and repeat the same estimations (Appendix Table A-5). The results of all models (1-6) are quite consistent with those included in Table 4.

hourly wage. This implies that although the wage levels of new entrants are procyclical at large firms, they are not sufficiently high if conditioned with the increase in the demand at such firms. With the control of the change in the demand level, medium firms are actually the ones that offer the most procyclical wages, possibly because of severer competition they face in the labor market than that faced by large firms.

**Table 5 Wage cyclicality of job-changers by firm size (2)**

Cyclical component of labor market (x)	(7)	(8)
	$(v/u)^{pref}$	$(v/u)^{pref}$
x	0.1017 *** (0.002)	0.0609 *** (0.002)
Interaction terms with x and firm-size dummies		
5000+	-0.0110 *** (0.002)	-0.0006 (0.002)
1000-4999	0.0005 (0.002)	0.0005 (0.002)
500-999	- -	- -
300-499	-0.0258 *** (0.002)	-0.0153 *** (0.002)
100-299	-0.0566 *** (0.002)	-0.0456 *** (0.002)
30-99	-0.0762 *** (0.002)	-0.0748 *** (0.002)
10-29	-0.0941 *** (0.002)	-0.1057 *** (0.002)
5-9	-0.1230 *** (0.003)	-0.1393 *** (0.003)
N	512,207	512,207
Adjusted R-sq	0.382	0.456
Estimation period	1991-2012	1991-2012

Note: Explained variable =  $\ln(\text{wage})$ . Wages are on an hourly basis, and deflated by CPI. X is labor market tightness at a prefectural level (models 7 and 8). In model (7), work hours are on a contractual basis, while they reflect both contractual and overtime hours in model (8). Quadratic terms of time trend are included in the regression. Other control variables include age, squared age, education level, gender, years of experience in the same kind of job, squared years of the experience, industry dummies, and establishment size (number of employees). Robust standard errors are in parentheses ; \*\*\*/\*\*/\* indicates the 1/5/10% level of significance.

On the contrary, the results of models 3 and 6 indicate that the procyclicality of wages are more obvious at smaller firms (i.e. wage offers of smaller firms are more responsive to a marginal increase in the unemployment rate). These results are robust even when I employ a

lead series of the unemployment rate by 6 months, given that the unemployment rate in Japan is a lagged index of the aggregate labor market conditions.

The results of models 1 and 4 and those of models 3 and 6 are seemingly incompatible<sup>47</sup>. A possible interpretation may be the difference in hiring sources; small firms set the wage levels almost exclusively depending on the level of unemployment pool, as they mainly hire employees from the pool. Large firms are likely to pay attention not only to the level of job seekers in the unemployment pool, but to the level of market tightness, taking account of poaching other firms. Unfortunately, the evidence from the Employment Trend Survey does not support this interpretation; the composition of the unemployment span experienced by job changers does not differ between large firms and small firms.

I next examine the impact of the trend included in the explanatory variable. For example, a clear increasing trend exists in the unemployment rate during the estimation period. I thus de-trend the series of the unemployment rate with HP filter, and re-estimate models (3) and (6) of Table 4 (Table 6). The results indicate that although the results are not so clear as the previous one, larger firms tend to offer more procyclical wages than smaller firms, except for the largest ones. The firms that belong to the largest category (i.e. over 5000 workers) show weaker procyclicality than their smaller counterparts (i.e. firms with 500-4999 workers)<sup>48</sup>.

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<sup>47</sup> I check the robustness of the results of Table 4 by separating the samples into those of “expansionary period” (i.e. when labor market tightness increases or when unemployment rate declines compared with the previous year) and those of “recession period” (i.e. when labor market tightness decreases or when unemployment rate increases compared with the previous year). The derived results are perfectly consistent with those of Table 4.

<sup>48</sup> The estimation results of parallel analysis of Tables 5 and 6 are included in the Appendix Table A-6 and A-7, respectively. The results are mostly consistent with those shown in Tables 5 and 6.

**Table 6 Wage cyclicality of job-changers by firm size (3)**

	Without taking into account overtime (3)'	Taking into account overtime (6)'
Cyclical component of labor market ( $x^{\text{cycle}}$ )	$UE^{\text{cycle}}$	$UE^{\text{cycle}}$
$x^{\text{cycle}}$	-0.0206 *** (0.004)	-0.0227 *** (0.004)
Interaction terms with $x^{\text{cycle}}$ and firm-size dummies		
5000+	0.0124 ** (0.005)	0.0127 ** (0.005)
1000-4999	-0.0062 (0.006)	-0.0071 (0.006)
500-999	-0.0188 *** (0.006)	-0.0199 *** (0.006)
300-499	- -	- -
100-299	-0.0069 (0.005)	-0.0068 (0.005)
30-99	-0.0003 (0.005)	0.0017 (0.005)
10-29	0.0105 ** (0.005)	0.0112 ** (0.005)
5-9	0.0172 *** (0.007)	0.0198 *** (0.007)
N	512,207	512,211
Adjusted R-sq	0.375	0.392
Estimation period	1991-2012	1991-2012

Note: Explained variable =  $\ln(\text{wage})$ . Wages are on an hourly basis, and deflated by CPI. In model (3)' work hours are on a contractual basis, while they reflect both contractual and overtime hours in model (6)'. In models (3)' and (6)'  $X^{\text{cycle}}$  is unemployment rate, de-trended with HP filter. Quadratic terms of time trend are included in the regression. Other control variables include age, squared age, educational level, sex, years of experience in the same kind of job, squared years of the experience, industry dummies, and establishment size (number of employees). The index of cyclical component of labor market corresponds to the period between April and June of the survey year. Robust standard errors are in parentheses, \*\*\*, \*\*, \* corresponds to significance level at 1%, 5%, 10%, respectively.

As mentioned in section 2, the dataset I have thus far employed does not contain samples of the majority of white-collar workers (e.g. clerks). Unfortunately, the information on previous experience is not available with regard to these workers. Based on the supplementary dataset, I thus estimate (C) by using the difference between current age and age upon graduation as a proxy for previous work experience. The estimation results are included in the Appendix

Table A-6. Although precise information on workers' previous experience is not available, I derive consistent results with the previous ones (Tables 4-6).

With regard to the estimations of Tables 4–6, I employ hourly real wages as my explained variables. In Table 7 below, I alternatively employ detrended monthly wages as explained variables and further examine whether the measures of wages would affect the derived results of Tables 4 and 5<sup>49</sup>.

**Table 7 Wage cyclicity of job-changers by firm size (4)**

	(9)	(10)	(11)	(12)	(13)
Cyclical component of labor market ( $x^{\text{cycle}}$ )	v/u	$\Delta$ new v	$(v/u)^{\text{pref}}$	UE	UE by age
$x^{\text{cycle}}$	0.1732 *** (0.003)	0.0752 *** (0.013)	0.1476 *** (0.002)	-0.0531 *** (0.001)	-0.0320 *** (0.000)
Interaction terms with $x^{\text{cycle}}$ and firm-size dummies					
5000+	0.0250 *** (0.004)	-0.1175 *** (0.017)	-0.0017 (0.003)	0.0594 *** (0.001)	0.0355 *** (0.000)
1000-4999	-0.0375 *** (0.003)	-0.1160 *** (0.019)	-0.0363 *** (0.003)	0.0428 (0.001)	0.0253 *** (0.000)
500-999	- -	- -	- -	0.0478 *** (0.001)	0.0291 *** (0.000)
300-499	-0.0632 *** (0.003)	-0.0577 *** (0.018)	-0.0475 *** (0.003)	0.0368 *** (0.001)	0.0229 *** (0.000)
100-299	-0.0887 *** (0.003)	-0.0511 *** (0.015)	-0.0622 *** (0.002)	0.0321 *** (0.001)	0.0212 *** (0.000)
30-99	-0.1409 *** (0.003)	-0.0701 *** (0.014)	-0.0986 *** (0.002)	0.0225 *** (0.001)	0.0156 *** (0.000)
10-29	-0.1862 *** (0.003)	-0.0728 *** (0.014)	-0.1322 *** (0.002)	0.0124 *** (0.012)	0.0092 *** (0.000)
5-9	-0.2490 *** (0.004)	-0.0689 *** (0.015)	-0.1775 *** (0.003)	- -	- -
N	512,816	331,071	512,816	512,816	512,816
Adjusted R-sq	0.361	0.353	0.360	0.364	0.361
Estimation period	1991-2012	1997-2012	1991-2012	1991-2012	1991-2012

Note: Explained variable = ln(wage). Wage level is deflated by the average growth rate of wages of all employees working at the establishments affiliated to the firms of the same size between the sample year and 2012 (base year). The estimation period is shorter in model 10, owing to data availability. Other control variables include age, squared age, education level, gender, years of experience in the same kind of job, squared years of experience, industry dummies, and establishment size (number of employees). The index of the cyclical component of the labor market corresponds to the period between April and June of

<sup>49</sup> As explained in section 2, the wage employed for the estimation in Table 7 is deflated by the wage growth of all employees hired at the establishments affiliated to the firms of the same size between period t and 2012 (base year). I employ this deflation as there is an obvious increasing trend in wage levels among all employees over the sample period.



the survey year. Robust standard errors are in parentheses; \*\*\*/\*\*/\* indicates the 1/5/10% level of significance.

Table 7 summarizes the main results, with the variables of aggregate labor market conditions are either labor market tightness (model 9), the growth rate of new vacancies by firm size (that corresponds to the size of firm  $j$ ) (model 10), u-v ratio at a prefectural level (model 11), unemployment rate at a national level (model 12), and unemployment rate by age group to which individual  $i$  belongs (model 13).

The results of Table 7 are fairly consistent with those of the previous tables (Table 4 and 5). The results of all models show that cyclical factors have a very strong impact on wages around the start of job, but the extent of this impact varies depending on firm sizes. In general, wages of job changers tend to be procyclical. Large firms are more responsive to labor market tightness at a national level as well as at a prefectural level than small firms (models 9 and 11), whereas this does not necessarily hold if I employ the growth rate of new vacancies by firm size as an indicator of labor market conditions (model 10). In other words, large firms (e.g. those greater than 1,000 employees) tend to offer even lower wages when the growth rate of new vacancies is higher. With control of cyclical changes in the number of new vacancies, firm size seems to have a single-peaked impact on the offered wage levels to job changers with its peak at medium-sized firms. On the contrary, the results of models 12 and 13 clearly indicate that the smaller the firm, the more responsive the wages offered to new job changers are to the aggregate labor market conditions. That is, smaller the firms are, it is more distinct that they offer higher wages to job changers when the unemployment rate is low, while this is not necessarily the case with quite large firms (i.e. those with more than 5,000 employees).

Finally, I would like to discuss the change in the composition of occupations among new jobs over business cycles. The above estimation does not control for job characteristics. However, previous literature such as Gertler and Trigari (2009) finds that any pro-cyclicality in new hires' wages disappears after conditioning worker and job characteristics. On the other hand, Martins et al. (2012) finds evidence in favor of wage pro-cyclicality having controlled for both worker and job characteristics. From my data, I cannot construct a sufficient size of establishment-job panel dataset<sup>50</sup>; I thus implement the estimation (C) by occupation and examine the coefficient by firm size among the same occupation. In sum, the estimation results show three patterns; in the first group, larger firms offer more procyclical wages to new entrants (e.g. sales clerk at department store or supermarket, waiter/waitress, and truck or bus drivers), in the second group, small firms tend to offer less procyclical or acyclical

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<sup>50</sup> Common establishment numbers are provided that allow me to construct a short-period panel dataset for recent years.

wages (e.g. some of the skilled workers at manufacturing factories), and in the third group, no obvious relationship is observed between firm size and pro-cyclicality of wages (e.g. doctors and nurses, computer operators, and insurance salesmen). Although it is hard to derive a general evidence that links the wage pro-cyclicality and firm sizes at an occupational level, at least I do not find any evidence that indicates small firms' wages are more procyclical than those of larger firms in any of 129 occupations. Given that there are many occupations that are categorized as the first group, I argue that the compositional changes of occupations in the new jobs over business cycles are not the unique factor that is behind the estimation results of (C) at an aggregate level.

## **5.2 Are wage offers more procyclical at medium firms than at large firms?**

The estimation results of previous sub-section indicate that procyclicality of wage offers is the strongest among firms with 100-1,000 workers than firms with more than 1,000 workers, when cyclicality is measured with the growth rate of new vacancies. Further, the estimation results with the de-trended unemployment rate imply that quite large firms (i.e. firms with more than 5,000 workers) offer wages with less procyclicality than large firms slightly smaller than them. If these are not uniquely caused by the uncontrolled factors including job characteristics, what are the possible backgrounds for the weaker procyclicality at very large firms? The theoretical prediction based on Moscarini and Postel-Vinay (2008) is in fact that large firms are the ones to have higher employment growth in a tight labor market, together with higher wage offers. Given that employment growth and wage offer to their entrants are both procyclical at large firms to a certain extent, I predict that the existing internal labor market at large firms obscures the impact of business cycle shocks with respect to wage offer<sup>51,52</sup>. On the other hand, medium firms do not have such developed internal labor markets, and the procyclicality of wage offer may be quite distinct among others. In other words, in Japan's labor market, I infer from the above findings that medium firms play the role of "large firms" in theory, vis-à-vis small firms.

Figure A-11 shows that the change in firm-size levels through job transition does not have any link with aggregate labor market conditions; medium firms usually accept workers from firms of various size (i.e. either larger or smaller firms) notwithstanding aggregate market

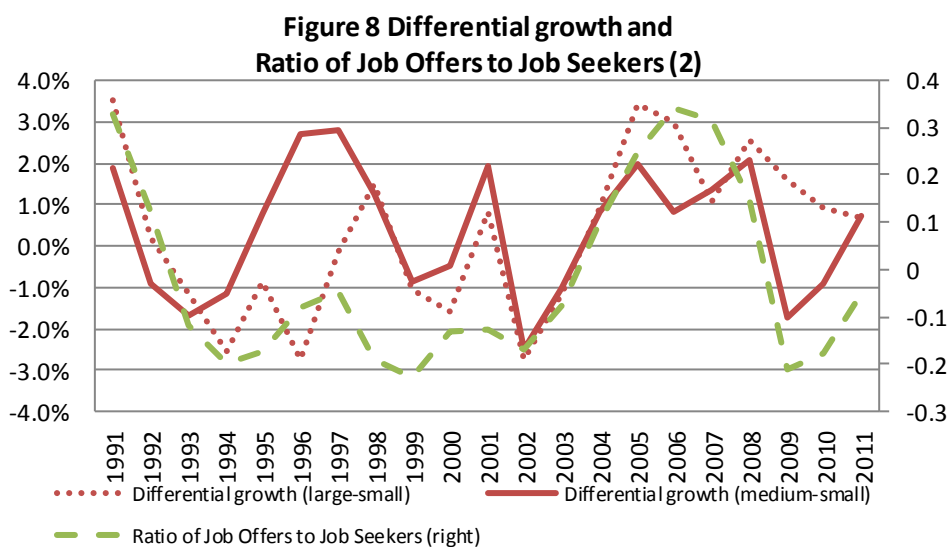
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<sup>51</sup> Papageorgiou (2013) argues that large firms are good internal labor markets that offer more opportunities to workers to find a suitable occupational match. He argues that workers in large firms are less likely to separate from those firms; rather, they are more likely to switch jobs within the same firms. His arguments are consistent with data from Japanese firms, in the following two respects: (1) large firms have lower job-destruction rates and worker separation rates (Appendix Figure A-6 and A-9), and (2) the size-wage premium is higher among longer-tenure workers.

<sup>52</sup> Li and Tian (2013) addresses the impact of job rotation within firms on labor market, and argues that large firms are benefitted from the opportunity to rotate workers to overcome the loss of mismatch, resulting lower separation rates and higher productivity than smaller firms.

conditions. To be precise, my prediction that medium firms play the role of “large firms” of the theoretical model does not necessarily hold, in the sense that large firms poach employees at small firms once labor market gets tighter in an expansion.

This can be confirmed by the finding that the differential growth rate between large and small firms is more procyclical than that between medium and small firms. Figure 8 below describes the differential net growth rate between large and small firms (already shown in Figure 1), as well as the differential between medium and small firms. The correlation between the latter differential and market tightness is low and not statistically significant. Interestingly, the correlation between the latter differential and the unemployment rate is higher in terms of absolute value and more significant, compared to the former differential<sup>53</sup>. These results indicate that large firms’ net employment growth, relative to small firms’ growth, is procyclical; thus, large firms grow more rapidly than small firms in a tight labor market (and vice versa, in a slack labor market), as expected from the theory. In contrast, medium firms’ net employment growth, relative to small firms’ growth, does not correlate with market tightness, while it apparently correlates with the unemployment rate, which is a lagged index of the aggregate labor market conditions. This could imply that in Japan, large firms grow within a tight labor market mainly by attracting workers from small firms, while medium firms grow in the economy with low unemployment rate either by hiring from the pool of the unemployed or by attracting workers from various sizes of firms.



To summarize the discussion within this sub-section, large and medium firms offer more procyclical wages at the point of job transition, compared to small firms. However, conditioned with the changes in the demand level that is newly created, the pro-cyclicality of

<sup>53</sup> More precisely, the correlation between the former differential and market tightness or unemployment rate is 0.675 ( $p$ -value: 0.0015) and  $-0.402$  ( $p$ -value: 0.088), respectively. On the other hand, the correlation between the latter differential and market tightness or unemployment rate is 0.104 ( $p$ -value:  $-0.60$ ) and  $-0.600$  ( $p$ -value: 0.0065), respectively.

wage offers is the most obvious at medium-sized firms. Further, if the condition of the aggregate labor market is proxied by the unemployment rate without trend, larger firms tend to show stronger wage procyclicality, except for the largest firms (i.e. over 5,000 workers). I infer that the existence of an internal labor market at large firms can possibly impair the straightforward wage pro-cyclicality at these firms.

## **6. Conclusions**

The current study investigated whether firms of different sizes adjusted their workforces in different ways over the business cycle in the 1990s and 2000s in Japan. My empirical analysis on worker/job mobility was based on matched worker–establishment data over the 1991–2011 period. I found empirical evidence that the differential growth rate of employment between large and small firms strongly and positively correlates with contemporaneous labor market tightness. Around the beginning of the expansion that started in 2002, large employers destroyed relatively more jobs relative to small employers when the market tightness was below trend, and created more jobs once it was above trend. Before that, in the 1990s, when the Japanese economy experienced its “lost decade,” the net employment growth of large employers remained negative, although it did fluctuate in terms of its correlation with labor market tightness. The empirical results of both quasi-panel analysis and establishment-level analysis indicated that cyclical conditions in the labor market—proxied by national employment fluctuations, labor market tightness, or unemployment rate—all affect job turnover and worker mobility. In terms of firm size, there was some evidence that the effects of such employment fluctuations tend to have greater impacts on larger firms, rather than smaller firms.

In addition to the fact that job/worker flows are more or less procyclical notwithstanding firm size, wage offers to job-changers are in general procyclical at the timing of job transition. By using data on wage levels to job changers, I found empirical evidence that medium and large firms set these wage offers in a more procyclical manner than do small firms. This result is quite robust among varied wage measures. Further, conditional on the growth rate of new vacancies, only medium firms offer pro-cyclical wages. From these empirical findings, I infer that in the Japanese labor market medium firms play the role of large firms, as per the theoretical model of Moscarini and Postel-Vinay (2008), given that the well-developed internal labor markets of large firms exist and obscure the procyclicality in wage offers to workers who make across-firm transits. However, the differential employment growth between medium and small firms did not so strongly correlate with labor market tightness, as the differential between large and small firms. Rather, the differential between medium and small firms is more related with the unemployment rate. I thus concluded that in a tight labor

market in Japan, large firms “poach” employees from small firms, and that such poaching is accompanied by higher wage offers to a certain extent. On the other hand, medium firms need to offer higher wages in a competitive environment to attract workers, either directly from other firms or from the unemployment pool.

In future research, concrete evidence will be needed to support the following conjecture: large firms have developed internal markets, and so their wage offers to new entrants are not necessarily higher in a tighter labor market. In addition, the factors that really distinguish “large,” “medium,” and “small” firms should be addressed; these are factors I did not address in the current study.

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## Appendix

**Table A-1 Summary statistics (1)**

Variable	Mean	SD	Min	Max	N
Full-time workers					
JCrate	0.023	0.028	0	0.713	3,062
JDrate	0.028	0.025	0	0.391	3,062
WArate	0.062	0.045	0	0.789	3,062
WSrate	0.067	0.039	0	0.479	3,062
Part-time workers					
JCrate	0.063	0.105	0	2.000	3,062
JDrate	0.063	0.096	0	1.821	3,062
WArate	0.122	0.135	0	2.000	3,062
WSrate	0.121	0.121	0	1.821	3,062

Source: Employment Trend Survey (1991-2011).

Note: JCrate stands for job creation rate, JDrate for job destruction rate, WArate for worker accession rate, and WSrate for worker separation rate. All these rates are those of regular fulltime workers. These statistics are based on a quasi-panel dataset by industry and firm size. Industries are limited to those with sufficient number of observations (15 industries, see footnote 37).

**Table A-2 Summary statistics (2)**

[Panel 1] Variable	Mean	SD	Min	Max	N
JCrate	0.039	0.113	0	2	15,640
JDrate	0.040	0.119	0	2	15,640
WArate	0.070	0.134	0	2	15,640
WSrate	0.071	0.138	0	2.309	15,640
Number of regular employees	44.06	186.66	0	21,735	15,662
Firm size					
1000+	0.050	0.218	0	1	15,662
300-999	0.045	0.206	0	1	15,662
100-299	0.102	0.302	0	1	15,662
30-99	0.207	0.405	0	1	15,662
5-29	0.596	0.491	0	1	15,662
[Panel 2] Variable	Mean	SD	Min	Max	N
JCrate	0.064	0.235	0	1.846	2,454
JDrate	0.033	0.088	0	1.650	2,454
WArate	0.135	0.192	0	0.959	2,454
WSrate	0.130	0.180	0	1.657	2,454
Number of regular employees	274.87	610.81	12	10,980	2,454
Firm size					
1000+	0.332	0.471	0	1	2,454
300-999	0.135	0.342	0	1	2,454
100-299	0.046	0.210	0	1	2,454
30-99	0.194	0.396	0	1	2,454
5-29	0.292	0.455	0	1	2,454



[Panel 3]

Variable	Mean	SD	Min	Max	N
JCrate	0.033	0.121	0	1.818	6,971
JDrate	0.053	0.198	0	2	6,971
WArate	0.068	0.220	0	6	6,971
WSrate	0.083	0.253	0	6	6,971
Number of regular employees	127.68	343.54	0	12,975	6,978
Firm size					
1000+	0.222	0.416	0	1	6,978
300-999	0.147	0.354	0	1	6,978
100-299	0.175	0.380	0	1	6,978
30-99	0.381	0.486	0	1	6,978
5-29	0.075	0.264	0	1	6,978

Source: Employment Trend Survey (Panel 1: 1993-1995, Panel 2 2006-2008, Panel 3 2009-2011)

Note: Same as Table A-1. Number of regular employees corresponds to the number of employees at the beginning of the observation year.

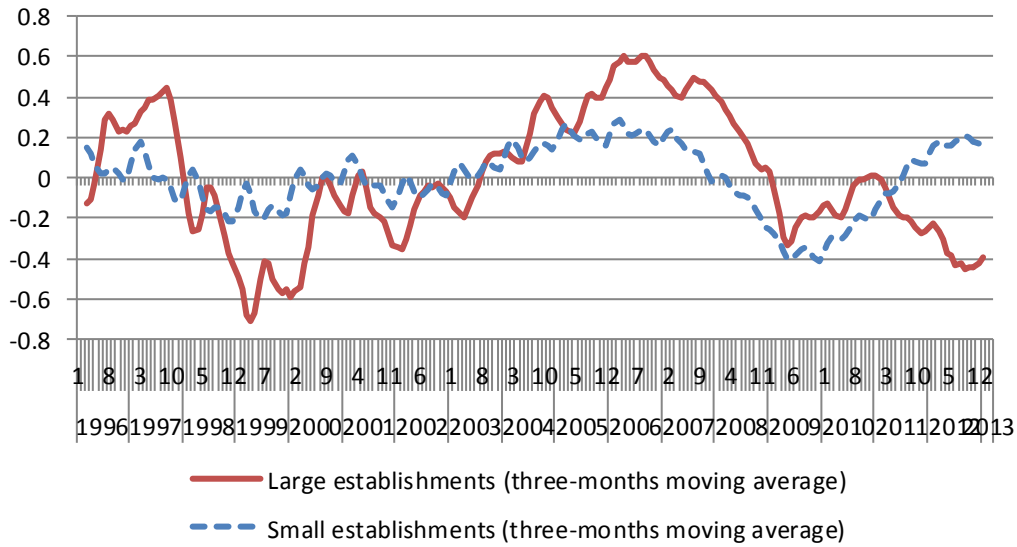
**Table A-3 Summary statistics (3)**

Variable	Mean	SD	Min	Max	N
lwage1	2.473	0.379	-2.439	6.779	517,537
lwage2	2.415	0.364	-2.439	6.779	517,537
lwage3	7.598	0.463	1.473	10.147	520,267
regular wage deflator	2,102.36	1,086.35	0	25,000	536,887
age	0.955	0.059	0.795	1.055	521,254
age	31.308	12.583	15	83	536,887
Male dummy	0.551	0.497	0	1	536,887
Educational level					
Junior high school	0.096	0.294	0	1	519,083
High school	0.541	0.498	0	1	519,083
College	0.201	0.401	0	1	519,083
University, Graduate	0.162	0.369	0	1	519,083
Experience	1.615	1.183	1	5	536,887
Number of permanent workers	161.869	442.251	0	27,127	536,887
Firm size (number of workers)					
5000+	0.137	0.344	0	1	536,887
1000-4999	0.092	0.289	0	1	536,887
500-999	0.070	0.255	0	1	536,887
300-499	0.071	0.257	0	1	536,887
100-299	0.173	0.378	0	1	536,887
30-99	0.212	0.409	0	1	536,887

Source: BSWS (1991-2012).

Note:  $lwage1 = \ln((\text{regular wage} - \text{overtime allowance}) / \text{regular work hours}) / (100 / \text{CPI})$ ,  $lwage2 = \ln(\text{regular wage} / (\text{regular work hours} + \text{overtime hours})) / (100 / \text{CPI})$ , and  $lwage3 = \ln(\text{regular wage} / \text{deflator})$ . Experience is a category variable as follows; 1 less than one year, 2 1-4 years, 3 5-9 years, 4 10-14 years, 5 more than 15 years. Samples are limited to regular fulltime workers with less than one-year tenure, with previous job experience.

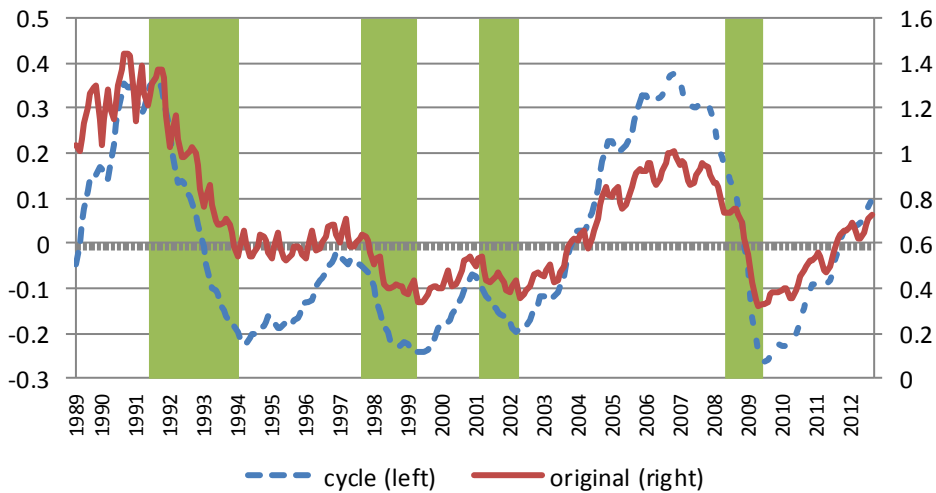
**Figure A-1 New vacancies (cycle)**



Source: “Employment referrals for general workers” (MHLW).

Note: Large establishments are those with more than 1,000 workers. Small establishments are those less than 30 workers. The log-differenced series of new vacancies (except those for part-time workers) is de-trended by HP filter and smoothed by taking a three-month moving average.

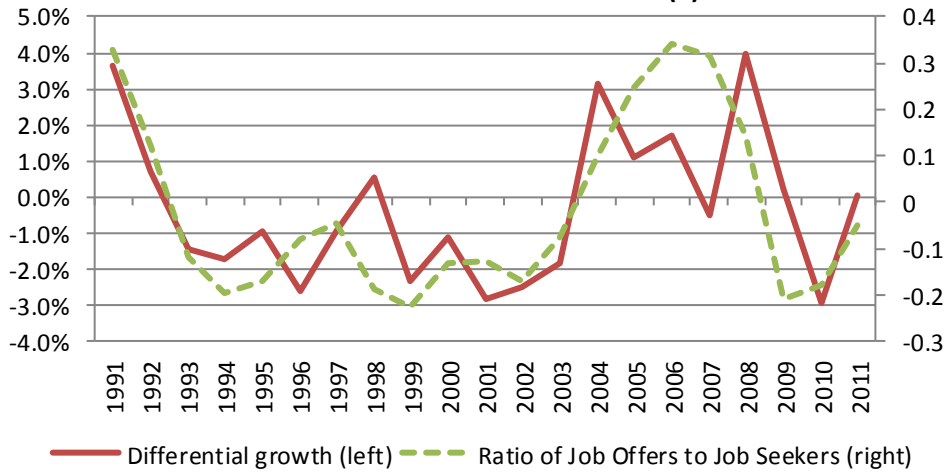
**Figure A-2 Labor market tightness**



Source: Same as Figure A-1.

Note: The original series corresponds to the fulltime ratio of job offers to job seekers (seasonally adjusted). The cycle series corresponds to a de-trended one with HP filter (and averaged over seven months to remove irregular fluctuations). The shaded period shows recession defined by CAO.

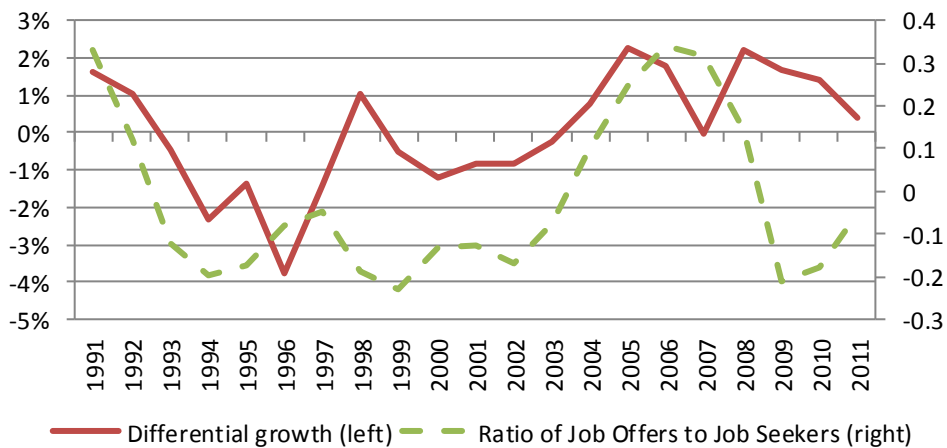
**Figure A-3 Differential growth and Ratio of Job Offers to Job Seekers (3)**



Source: (a) Differential growth: “Employment Trend Survey” (MHLW), (b) Ratio of Job Offers to Job Seekers: “Employment Referrals for General Workers” (MHLW).

Note: The differential growth rate is calculated based on the initial employee number at each establishment (lower bound=50, higher bound=500). The correlation between the differential growth and ratio of job offers to job seekers is 0.694 (p-value 0.0010).

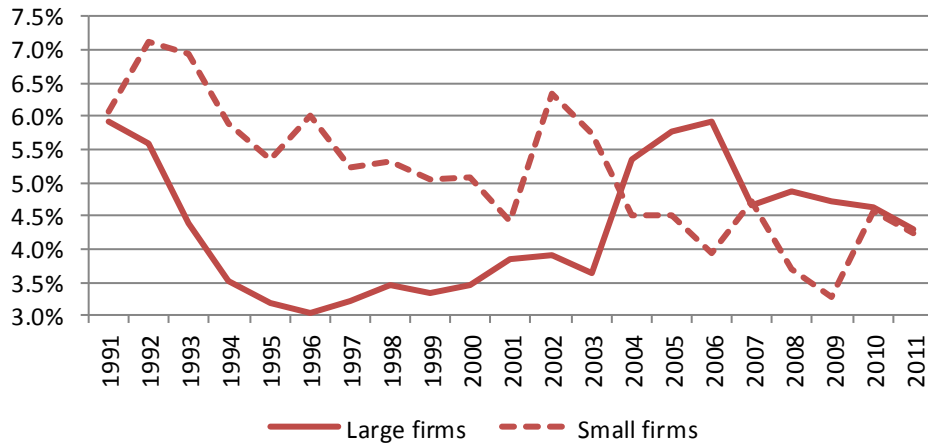
**Figure A-4 Differential growth and Ratio of Job Offers to Job Seekers (3)**



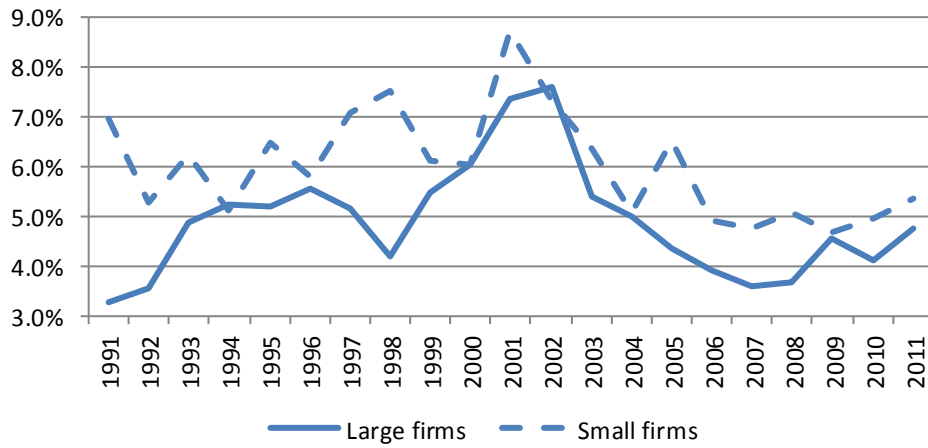
Source: (a) Differential growth: “Employment Trend Survey” (MHLW), (b) Ratio of Job Offers to Job Seekers: “Employment Referrals for General Workers” (MHLW).

Note: The differential growth rate is calculated by comparing the largest firms with all the rest of firms. The correlation between the differential growth and ratio of job offers to job seekers is 0.499 (p-value 0.03).

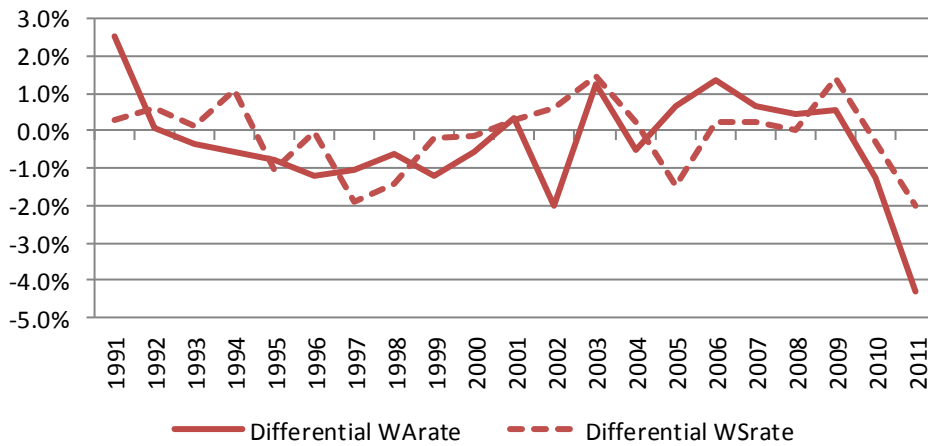
**Figure A-5 Job creation rate (full-time workers)**



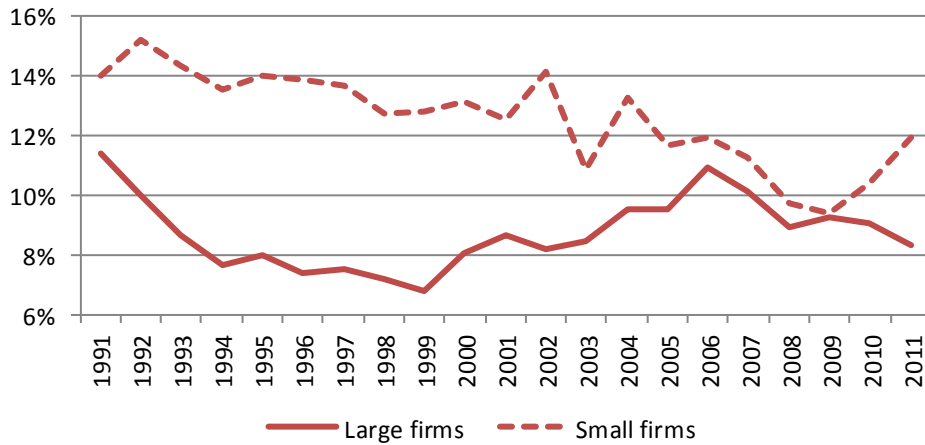
**Figure A-6 Job destruction rate (full-time workers)**



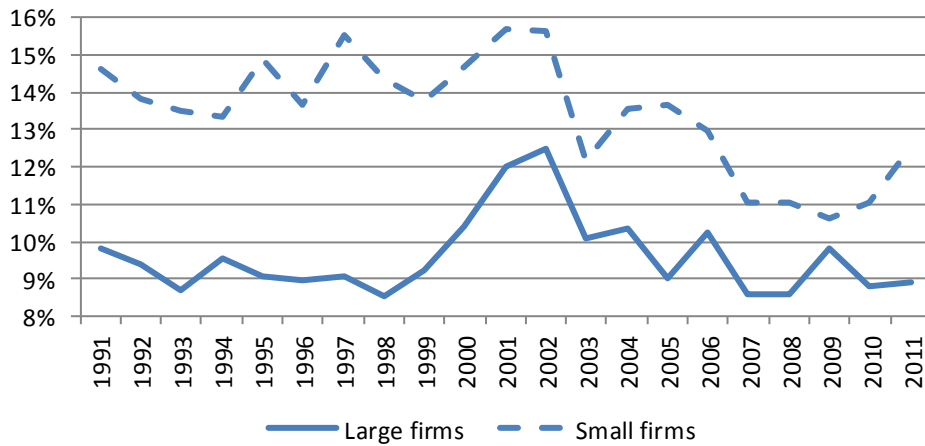
**Figure A-7 Differential worker flows (full-time workers)**



**Figure A-8 Worker accession rate (full-time workers)**



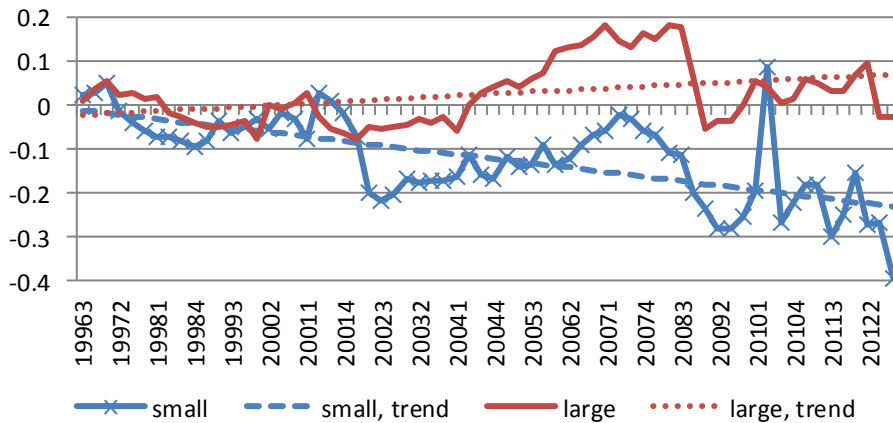
**Figure A-9 Worker separation rate (full-time workers)**



Source: "Employment Trend Survey" (MHLW) (Figures A-5- A-9).

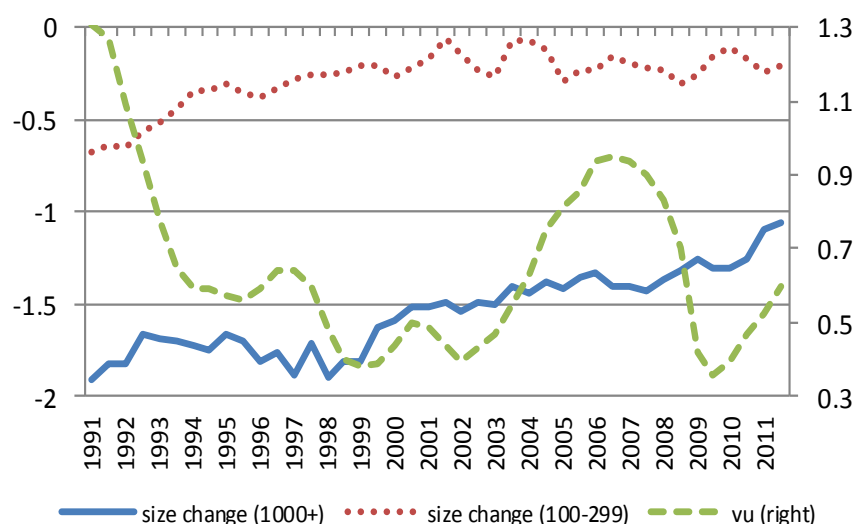
Note: In Figure A-7, both series are de-trended.

**Figure A-10 Cumulative sum of log-differenced sales data**



Source: “Financial Statements Statistics of Corporations by Industry” (Ministry of Finance).

**Figure A-11 Size change by firm size and business cycle**



Note: Size changes are calculated as an average of the difference in the size of current firm and the size of previous firms among full-time job changers who looked for a job for less than one month. The firm size is proxied by the index of employee number as follows; (1: more than 1000, 2: 300-999, 3: 100-299, 4: 30-99, 5: 5-29, 6: 1-4). Therefore, if the average size change is greater in its absolute value, it indicates that the firms accept workers from smaller firms.

**Table A-4 Size-specific effects of cyclical factors on job reallocation and worker mobility (full-time workers) (3)**

**[Panel 2]**

(1) Job creation

Firm size	mean	sd	min	max	p25	p50	p75	N
1000+	0.024	0.046	-0.031	0.296	-0.003	0.012	0.036	287
300-999	0.009	0.031	-0.033	0.154	-0.010	0.002	0.015	110
100-299	0.021	0.107	-0.025	0.343	-0.018	-0.011	0.001	11
30-99	-0.021	-	-0.021	-0.021	-0.021	-0.021	-0.021	1
Total	0.020	0.045	-0.033	0.343	-0.006	0.008	0.030	409

(2) Job destruction

Firm size	mean	sd	min	max	p25	p50	p75	N
1000+	0.013	0.036	-0.059	0.385	-0.001	0.005	0.017	287
300-999	0.017	0.046	-0.012	0.354	0.001	0.004	0.015	110
100-299	0.019	0.017	0.003	0.063	0.006	0.014	0.025	11
30-99	0.019	-	0.019	0.019	0.019	0.019	0.019	1
Total	0.014	0.038	-0.059	0.385	-0.001	0.005	0.017	409

(3) Worker accessions

Firm size	mean	sd	min	max	p25	p50	p75	N
1000+	0.018	0.054	-0.080	0.237	-0.021	0.008	0.040	287
300-999	-0.003	0.051	-0.097	0.262	-0.040	-0.003	0.025	110
100-299	-0.037	0.026	-0.079	0.013	-0.059	-0.038	-0.023	11
30-99	-0.072	-	-0.072	-0.072	-0.072	-0.072	-0.072	1
Total	0.011	0.054	-0.097	0.262	-0.026	0.003	0.035	409

(4) Worker separations

Firm size	mean	sd	min	max	p25	p50	p75	N
1000+	0.018	0.055	-0.068	0.364	-0.016	0.006	0.036	287
300-999	0.009	0.061	-0.054	0.384	-0.024	-0.004	0.025	110
100-299	-0.009	0.032	-0.061	0.065	-0.029	-0.009	0.004	11
30-99	-0.038	-	-0.038	-0.038	-0.038	-0.038	-0.038	1
Total	0.015	0.056	-0.068	0.384	-0.019	0.003	0.032	409

**[Panel 3]**

(1) Job creation

Firm size	mean	sd	min	max	p25	p50	p75	N
1000+	-0.025	0.101	-0.087	1.988	-0.061	-0.044	-0.018	657
300-999	-0.035	0.057	-0.087	0.498	-0.066	-0.052	-0.025	243
100-299	-0.005	0.092	-0.072	0.410	-0.058	-0.033	0.009	145
30-99	-0.011	0.093	-0.087	0.525	-0.060	-0.042	-0.007	118
5-29	-0.006	0.104	-0.080	0.340	-0.071	-0.049	0.010	17
Total	-0.023	0.092	-0.087	1.988	-0.062	-0.045	-0.015	1180

(2) Job destruction

Firm size	mean	sd	min	max	p25	p50	p75	N
1000+	-0.042	0.132	-0.133	1.973	-0.087	-0.071	-0.041	657
300-999	-0.017	0.175	-0.100	1.963	-0.081	-0.063	-0.020	243
100-299	-0.013	0.115	-0.098	0.514	-0.079	-0.057	0.005	145
30-99	-0.016	0.175	-0.118	1.650	-0.080	-0.056	-0.007	118
5-29	0.390	1.157	-0.098	4.662	-0.048	0.019	0.148	17
Total	-0.024	0.204	-0.133	4.662	-0.084	-0.066	-0.028	1180

(3) Worker accessions

Firm size	mean	sd	min	max	p25	p50	p75	N
1000+	-0.025	0.101	-0.087	1.988	-0.061	-0.044	-0.018	657
300-999	-0.035	0.057	-0.087	0.498	-0.066	-0.052	-0.025	243
100-299	-0.005	0.092	-0.072	0.410	-0.058	-0.033	0.009	145
30-99	-0.011	0.093	-0.087	0.525	-0.060	-0.042	-0.007	118
5-29	-0.006	0.104	-0.080	0.340	-0.071	-0.049	0.010	17
Total	-0.023	0.092	-0.087	1.988	-0.062	-0.045	-0.015	1180

(4) Worker separations

Firm size	mean	sd	min	max	p25	p50	p75	N
1000+	-0.017	0.179	-0.374	2.375	-0.094	-0.057	0.018	657
300-999	-0.018	0.179	-0.152	1.933	-0.105	-0.063	0.004	243
100-299	-0.008	0.109	-0.147	0.429	-0.088	-0.029	0.049	145
30-99	0.005	0.277	-0.148	1.992	-0.092	-0.065	0.006	118
5-29	0.355	1.119	-0.147	4.568	-0.047	0.023	0.099	17
Total	-0.009	0.229	-0.374	4.568	-0.094	-0.057	0.018	1180

**Table A-5 Wage cyclicality of job-changers by firm size (5)**

Cyclical component of labor market (x)	Without taking into account overtime			Taking into account overtime		
	(1) (v/u)	(2) $\Delta$ new_v	(3) UE	(4) (v/u)	(5) $\Delta$ new_v	(6) UE
x	-0.1139 *** (0.003)	0.0196 *** (0.012)	-0.0443 *** (0.001)	-0.1244 *** (0.003)	0.0252 *** (0.012)	-0.0479 *** (0.001)
Interaction terms with x and firm-size dummies						
5000+	0.2235 *** (0.004)	-0.0262 *** (0.017)	0.0415 *** (0.001)	0.2441 *** (0.004)	-0.0307 *** (0.017)	0.0454 *** (0.001)
1000-4999	0.2075 *** (0.003)	-0.0184 *** (0.016)	0.0394 *** (0.001)	0.2270 *** (0.003)	-0.0283 *** (0.016)	0.0431 *** (0.001)
500-999	0.1941 *** (0.003)	- -	0.0371 *** (0.001)	0.2123 *** (0.003)	- -	0.0405 *** (0.001)
300-499	0.1550 *** (0.003)	-0.0128 *** (0.016)	0.0303 *** (0.001)	0.1732 *** (0.003)	-0.0157 *** (0.016)	0.0338 *** (0.001)
100-299	0.1137 *** (0.003)	-0.0338 *** (0.014)	0.0223 *** (0.001)	0.1286 *** (0.003)	-0.0390 *** (0.013)	0.0252 *** (0.001)
30-99	0.0784 *** (0.003)	-0.0377 *** (0.013)	0.0163 *** (0.001)	0.0878 *** (0.003)	-0.0425 *** (0.013)	0.0182 *** (0.001)
10-29	0.0505 *** (0.003)	-0.0237 *** (0.012)	0.0100 *** (0.001)	0.0551 *** (0.003)	-0.0310 *** (0.012)	0.0107 *** (0.001)
5-9	- -	-0.0349 *** (0.013)	- -	- -	-0.0421 *** (0.013)	- -
N	381,272	244,403	381,272	381,272	244,403	381,272
Adjusted R-sq	0.425	0.419	0.426	0.445	0.436	0.446
Estimation period	1991-2012	1997-2012	1991-2012	1991-2012	1997-2012	1991-2012

Note: Samples are limited to the workers who worked (a) more than 18 days per month, and (b) longer than 7 hours per day on average. Explained variable =ln(wage). Wages are on an hourly basis, and deflated by CPI. In models (1)- (3), work hours are on a contractual basis, while they reflect both contractual and overtime hours in models (4)-(6). X is labor market tightness (models 1 and 4), the growth rate of new vacancies by firm size (models 2 and 5), or unemployment rate (models 3 and 6). Estimation period is shorter in models (2) and (5) because of data availability. Quadratic terms of time trend are included in the regression. Other control variables include age, squared age, educational level, sex, years of experience in the same kind of job, squared years of the experience, industry dummies, and establishment size (number of employees).The index of cyclical component of labor market corresponds to the period between April and June of the survey year. Robust standard errors are in parentheses, \*\*\*, \*\*, \* corresponds to significance level at 1%, 5%, 10%, respectively.



**Table A-6 Wage cyclicality of job-changers by firm size (6)**

	(7)	(8)
Cyclical component of labor market (x)	(v/u) <sup>pref</sup>	(v/u) <sup>pref</sup>
x	0.1089 *** (0.002)	0.1142 *** (0.002)
Interaction terms with x and firm-size dummies		
5000+	0.0086 *** (0.002)	0.0106 *** (0.002)
1000-4999	0.0059 *** (0.002)	0.0069 *** (0.002)
500-999	-	-
300-499	-0.0283 *** (0.002)	-0.0284 *** (0.002)
100-299	-0.0565 *** (0.002)	-0.0591 *** (0.002)
30-99	-0.0773 *** (0.002)	-0.0841 *** (0.002)
10-29	-0.0975 *** (0.002)	-0.1076 *** (0.002)
5-9	-0.1317 *** (0.003)	-0.1453 *** (0.003)
N	381,272	381,272
Adjusted R-sq	0.424	0.443
Estimation period	1991-2012	1991-2012

Note: Samples are limited to the workers who worked (a) more than 18 days per month, and (b) longer than 7 hours per day on average. Other notes are the same as those of Table 5.

**Table A-7 Wage cyclicality of job-changers by firm size (7)**

	(3)'	(6)'
Cyclical component of labor market (x <sup>cycle</sup> )	UE <sup>cycle</sup>	UE <sup>cycle</sup>
x <sup>cycle</sup>	-0.0268 *** (0.004)	-0.0302 *** (0.004)
Interaction terms with x <sup>cycle</sup> and firm-size dummies		
5000+	-0.0110 * (0.006)	-0.0074 (0.006)
1000-4999	-0.0006 (0.006)	-0.0013 (0.006)
500-999	-0.0060 (0.006)	-0.0056 (0.006)
300-499	-	-
100-299	-0.0019 (0.005)	-0.0002 (0.005)
30-99	0.0105 ** (0.005)	0.0134 *** (0.005)
10-29	0.0157 *** (0.005)	0.0172 *** (0.005)
5-9	0.0255 *** (0.007)	0.0304 *** (0.007)
N	381,272	381,272
Adjusted R-sq	0.413	0.430
Estimation period	1991-2012	1991-2012

Note: Samples are limited to the workers who worked (a) more than 18 days per month, and (b) longer than 7 hours per day on average. Other notes are the same as those of Table 6.

**Table A-8 Wage cyclicality of job-changers by firm size (8)**

Cyclical component of labor market (x)	Without taking into account overtime			Taking into account overtime		
	(1)''	(2)''	(3)''	(4)''	(5)''	(6)''
	(v/u)	(v/u) <sup>pref</sup>	UE	(v/u)	(v/u) <sup>pref</sup>	UE
x	-0.1054 *** (0.003)	-0.0966 *** (0.003)	-0.0394 *** (0.001)	0.0689 *** (0.003)	- -	-0.0433 *** (0.001)
Interaction terms with x and firm-size dummies						
5000+	0.1781 *** (0.004)	0.1574 *** (0.003)	0.0345 *** (0.001)	0.0141 *** (0.003)	0.0700 *** (0.003)	0.0389 *** (0.001)
1000-4999	0.1708 *** (0.003)	0.1494 *** (0.003)	0.0330 *** (0.001)	0.0073 *** (0.003)	0.0621 *** (0.003)	0.0374 *** (0.001)
500-999	0.1672 *** (0.003)	0.1449 *** (0.003)	0.0318 *** (0.001)	- -	0.0545 *** (0.003)	0.0355 *** (0.001)
300-499	0.1320 *** (0.003)	0.1153 *** (0.003)	0.0261 *** (0.001)	-0.0359 *** (0.003)	0.0242 *** (0.003)	0.0297 *** (0.001)
100-299	0.0891 *** (0.003)	0.0774 *** (0.002)	0.0176 *** (0.001)	-0.0809 *** (0.003)	-0.0155 *** (0.002)	0.0208 *** (0.001)
30-99	0.0611 *** (0.003)	0.0529 *** (0.002)	0.0127 *** (0.000)	-0.1161 *** (0.003)	-0.0461 *** (0.002)	0.0147 *** (0.000)
10-29	0.0374 *** (0.003)	0.0328 *** (0.002)	0.0075 *** (0.000)	-0.1436 *** (0.003)	-0.0697 *** (0.002)	0.0085 *** (0.000)
5-9	- -	- -	- -	-0.1866 *** (0.003)	-0.1072 *** (0.003)	- -
N	502,346	517,533	517,533	502,350	517,537	517,533
Adjusted R-sq	0.365	0.366	0.367	0.385	0.385	0.386
Estimation period	1991-2012	1991-2012	1991-2012	1991-2012	1991-2012	1991-2012

Note: Samples are limited to those without the responses of “previous experience in the present job.” Explained variable =ln(wage). Wages are on an hourly basis, and deflated by CPI. In models (1)''- (3)'', work hours are on a contractual basis, while they reflect both contractual and overtime hours in models (4)''-(6)''. X is labor market tightness (models 1'' and 4''), labor market tightness by prefecture (models 2'' and 5''), or unemployment rate (models 3'' and 6''). Quadratic terms of time trend are included in the regression. Other control variables include age, squared age, educational level, sex, years of experience in the same kind of job, squared years of the experience (proxied by the difference between current age and estimated age upon graduation), industry dummies, and establishment size (number of employees). The index of cyclical component of labor market corresponds to the period between April and June of the survey year. Robust standard errors are in parentheses, \*\*\*, \*\*, \* corresponds to significance level at 1%, 5%, 10%, respectively.