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THE ROLE OF NON-REGULAR WORK FOR LABOUR INPUT ADJUSTMENT IN JAPAN

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Abstract (254 words)

Despite the the rising incidence of non-regular work and of changing structures in Japanese labor markets, macro-economic data do not suggest that the adjustment behaviour of employers during the global crisis is very different from those observed during previous downturns: Japanese firms continued to hoard on a massive scale and large adjusted by reducing working time, while job loss were limited. In order to explain this somewhat surprising stylised fact, this paper examines the implications of the rise in non-regular work for labour market resilience using two types of large nationally representative dataset of establishments for the period 1991-2009, focucing on the global crisiss; namely Employment Trend Survey and Monthly Labor Survey. Taking the net yearly employment change and net quarterly total hour change of each establishment as the proxy of labor demand shock they received, we first examined a general view of labor input adjustment, by using non-parametric as well as parametric approach, showing a 'churning' and 'kinked' behaviours of adjustments. The data also shows, compared with the distribution in total hour change during the Asian Crisis, the share of establishments which increased total labor input has not been deteriorated during the global crisis. To confirm the role of distributional shift to explain the actual fluctuations in hiring and separation, we conducted some simulations and found that the de-regulation of non-regular workers has surely encouraged to hire the non-regular workers through reducing the restriction of using fixed-term contracts, while the fluctuation in separation can be explained by the change in distribution of shocks.

Keywords: labour market duality, labour market resilience, job quality, temporary work, crisis

JEL codes: D22, E24, J23, J41

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1. Introduction

1. During the financial crisis of 2008 and 2009, the Japanese labour market exhibited a remarkable redilience to shocks as witnessed by the relative stability of the unemployment rate. The stability is in accord with traditional behaviours, reflecting to a large extent the importance of the long-term employment system which refers to the practice where firms hire workers directly out of school and where a significant portion of employees only leaves their employer at the mandatory retirement age. An important feature of this system is the strong commitment of employers to preserve jobs during periods of slack aggregate demand. The low responsiveness of employment to shocks is likely to be an important factor explaining why Japan has been able to maintain low unemployment rates for such a long time, while in many other countries, particularly in Europe, cyclical rises in unemployment had a tendency to become permanent, resulting in ever higher levels of structural unemployment in the aftermath of shocks. However, the exhibited resilience had not been expected in those days because of structural changes Japan had conducted since the collapse of the bubble in 1992. The rapid increase in the share of non-regular work during the lost decades was an undoubtedly visible sign, that is driven by the gradual liberalisation of the market for temporary work during the late 1990s. In addition, the unemployment rate had gradually increased which appears to have become more sensitive to business conditions. Given the experience of labor market reforms, the recent negative shock in output was so huge as to expect a tremendous crisis in labor market, too.

2. From the view point of labor market resilience, on the other, the rise in non-regular work and unemployment rates is enough to raise important questions, that is, the ability to maintain low and stable unemployment rates.[1] To what extent does the rise in non-regular work make unemployment more responsive to adverse economic shocks? And to what extent, does the rise in non-regular work reduce the risk that cyclical increases in unemployment become structural? This paper examines the implications of the rise in non-regular work for labour market resilience using a large nationally representative panel dataset of establishments for the period 1991-2009. After some descriptions, the analysis proceeds in two steps. In the first step, the way firms adjust their labour inputs in response to output shocks is analysed by comparing adjustment patterns between regular and non-regular workers relative to start of the sample in 1994. In doing so, it attempts to verify the validity of two conjectures with the respect to the role of the increased incidence of non-regular work for the adjustment behaviour of firms: i) the rise in non-regular work shifts the burden of adjustment from hours to employment; ii) the rise in non-regular work shifts the

1 . See OECD (2011) for a detailed discussion of the concept of labour market resilience.

burden of adjustment from permanent to temporary workers by increasing the hiring probability of temporary workers and reducing the separation probability of permanent workers. In order to identify the role of non-regular work the methodological framework controls for differences in the size of shocks between periods, for differences in the distribution of shocks across firms with different adjustment technologies; and for any differences in the initial growth distribution of firms. Combining two discussions we asses the aggregate implications of the rise in non-regular work for hiring, separations, employment and hours.

3. The remainder of this paper is structured as follows. Section 1 provides some further background on the way the Japanese labour market has developed before the crisis, and particularly on the rise in the incidence of non-regular work. Section 2 sets out the methodological framework to analyse how firms adjust their labour inputs and to assess the macro-economic implications of any changes in the way firms adjust. Section 3 and 4 describe the data. Section 5 presents micro-economic results for the average adjustment behaviour of firms. It also documents how this differs across different types of firms and over time. Section 6 analyses how the adjustment behaviour of firms has changed with respect to regular and non-regular workers. Section 7 concludes.

2. Background

2.1 Labour market developments before the crisis

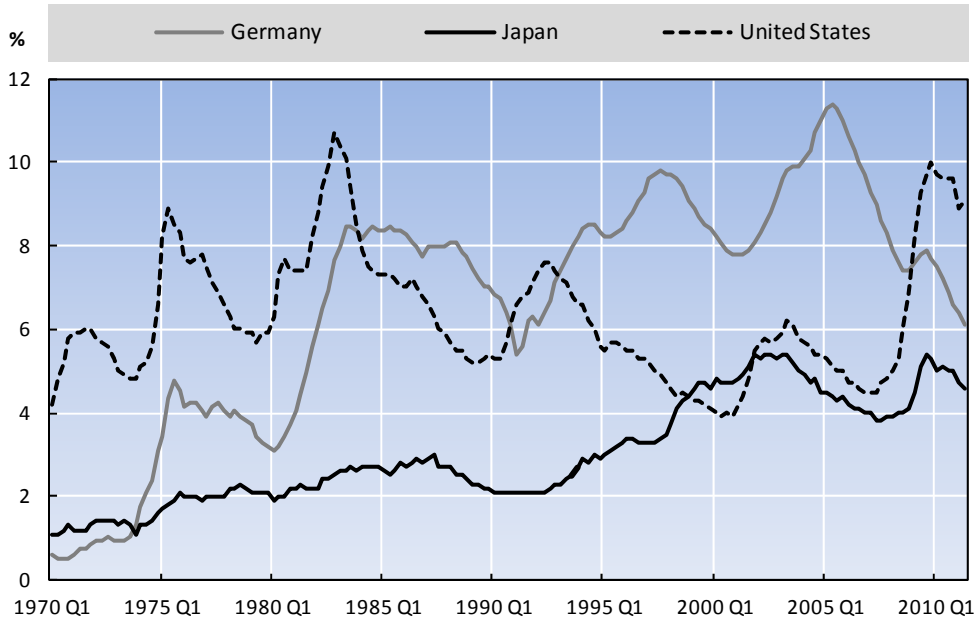
Unemployment has increased

4. Traditionally unemployment in Japan has been small and relatively insensitive to the business cycle. Figure 1 shows the evolution of the unemployment rate in Japan along with that in Germany and the United States since the 1970s to date. The comparison between Germany and Japan is particularly interesting as unemployment rates were very low in both countries in the early 1970s (around 1%), but have evolved very differently. Although in both countries the cyclical hikes in unemployment that followed the oil shocks of the 1970s tended to persist for a long time, resulting in gradually rising unemployment rates, the cyclical increases in unemployment were much stronger in Germany than in Japan. While in Germany the unemployment rate increased to around 4% after the first oil shock and around 8% after the second one, the unemployment rate in Japan increased only minimally to 2% after the first oil shock and almost 3% after the second one. As a result, the unemployment rate in Japan has been

very stable and remained below 3% until the collapse of the bubble in 1992. The Japanese labour market has been remarkably resilient in comparison with other major OECD countries during the same period.

Figure 1. **Evolution of the harmonised unemployment rate in Germany, Japan and the United States**

Percentage of total labour force, 1970 Q1-2007 Q4



Source: OECD Main Economic Indicators Database.

Adjustment behaviours behind

5. The relative stability of the unemployment rate in Japan during the 1970s and 1980s partially reflects the role of strong macroeconomic performance; but it also reflects the importance of the long-term employment system. Generally the long-term employment system consists of two key features. First, employers are committed to maintaining stable employment levels and to avoiding layoffs in response to cyclical changes in business conditions. Rather than laying off workers, firms tend to reduce working hours or hoard labour at the cost of lower productivity and profitability.[2] Second, the age-earnings profile is steep by international standards, resulting in strong incentives for work (Lazear, 1981; Hashimoto and Raisian, 1985). This system of "delayed payments" also reduces incentives for workers to change employer. Together these two features ensure that firms and workers have strong incentives to invest in firm-specific

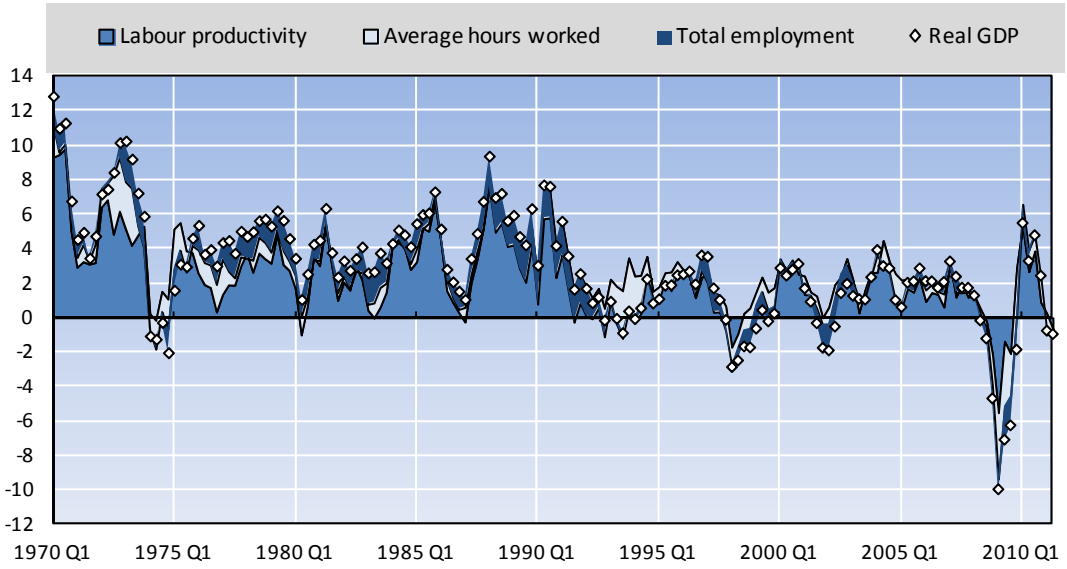
2 . Freeman and Weitzman (1986) further highlight the importance of the bonus system as source of wage flexibility.

human capital. Additional practices such as direst hiring out of schools and respect for mandatory retirement age construct a nexus of institutions (Aoki, 1990; Kato and Kambayashi, 2011).

6. The actual adjustment behaviour, resulted from the system, is summarized in figure 2. It decomposes the change in output (real GDP) into changes in labor productivity, average hour worked and total employment. During the half of century since the first oil shock, the Japanese economy has experienced output shrink several times; and it is easily found that reducing output has been achieved by adjusting average hours and productivity, while the employment change has been a minor counter-measure. The figure also shows the recent crisis is the extraordinary large negative shock to the Japanese economy, keeping the adjustment as before.[3]

Figure 2: Labour input adjustment in Japan, 1970Q1 – 2010Q4

Year-to-year percentage changes



Source: OECD Main Economic Indicators Database.

3. The downturn in 2002 is possible to be an exception, because the labor adjustment has been taken by reducing employment. One possible interpretation is that the different cause of downturn; the 2002 recession has been occurred mainly due to the regulational change in audit of financial intermidiates. To satisfy a new condition on their balance sheet, creditors withdraw their funds from inferior debtor. This is why the recession is often called as "Balance Sheet Recession." As the international economic climate was not in recession, the negative shock in this era behaved as a reallocative shock rather than a demand shock. The published table from Employment Trend Survey in Annex Figure A reveals the separation due to economic dismissal increased between 2001 and 2002.

Rising non-regularworkers

7. Instead of stable adjustment behaviours the unemployment rate has steadily increased and partially converged to unemployment rates in other major OECD countries since the collapse of the bubble in 1992. In part, this is likely to reflect weak labour demand conditions related the poor growth performance of the Japanese economy during the lost decades as in figure 2. But the unemployment rate also appears to have become more sensitive to business conditions (Steinberg and Nakane, 2011). This suggests that there may also have been important structural changes to the way the labour market operates. The most visible of those is undoubtedly the rapid increase in the share of non-regular work during the lost decades.

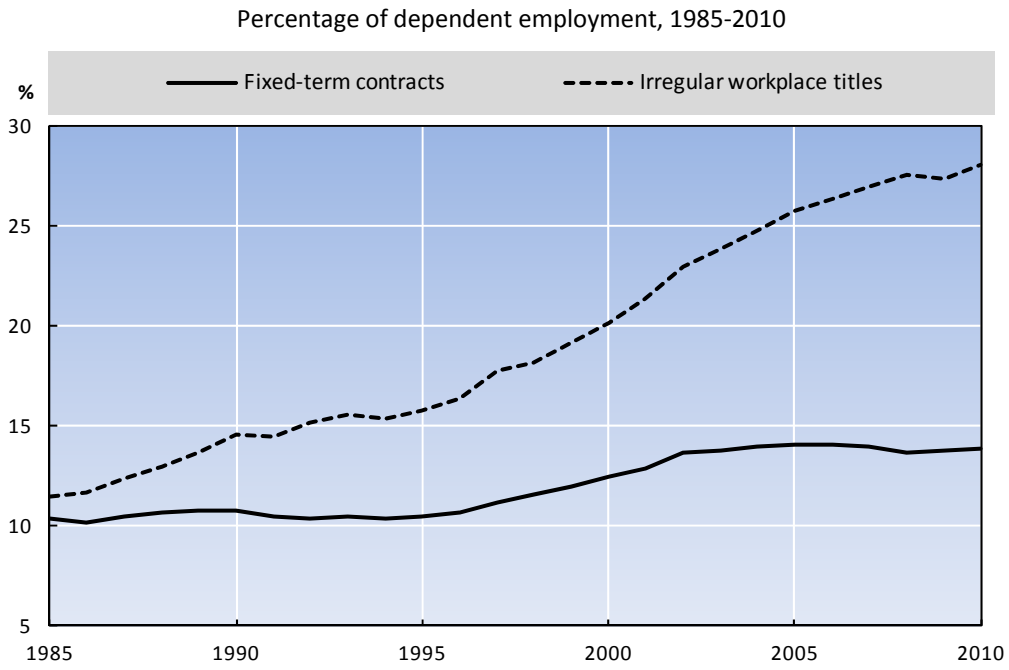
8. In Japan, mainly two different concepts of non-regular work are used. The first concept is legal in nature and is based on whether a contract is open-ended or not. This tends to be the definition used to describe non-regular work in most other countries. This is also the relevant concept when considering the impact of reforms to employment protection rules and particularly those that govern the market for temporary work. The second concept is based on workplace titles. This includes amongst others part-time workers, temporary workers and dispatched workers.[4] The second concept of non-regular work is particularly useful when considering human resource managements and labour conditions. One important reason for this is that Japanese labour unions have traditionally excluded workers with non-regular job titles. Given no-extensition mechanism, this practically means that collective agreements only tend to cover workers with regular workplace titles. Since almost all workers with a temporary contract will also have an non-regular workplace title and a substantial number of workers with non-regular workplace titles have open-ended contracts, the workplace-title concept of non-regular work is usually broader than the legal concept.

9. Figure 3 shows the evolution of non-regular work as a share of total dependent employment using both the legal definition and that based on workplace titles. Data for non-regular work based on the legal concept are obtained from the core questionnaire of the Japanese *Monthly Labour Force Survey* whereas data on non-regular work based on workplace titles are obtained from its *Quarterly Supplement*. It shows that non-regular work based on the legal definition was stable at about 10% up to 1996, then increased gradually to about 14% in 2002 and has been broadly stable since. The incidence of non-regular

4 . Since the various irregular workplace titles are overlapping and self-reported it is difficult to say anything about these relative groups. OECD (2011) nevertheless suggests that part-time work account for about two-thirds of irregular workers in 2010. Moreover, the share of part-time workers in the total number of irregular workers has increased only modestly during the crisis period (from 65.8% to 67.3%), suggesting that their sensitivity economic shocks is fairly similar.

work measured in terms of workplace titles has increased more quickly than that based on the legal definition: the incidence of non-regular work based on workplace titles more than doubled whereas the incidence of temporary work increased by about 50%. This indicates that the number of workers with open-ended contracts, but non-regular workplace titles also tended to increase relative to the number of regular workers. This may reflect the rising incidence of part-time work, which in part may be related to the gradual increase in female labour force participation. Apart from increasing more rapidly, the time-profiles of two series are also somewhat different. The share of non-regular work in total dependent employment increased steadily during the period 1985-1995, accelerated during the period 1996-2008 and slightly declined since the beginning of the global crisis. As the definition of non-regular work based on workplace titles is broader the incidence of non-regular work is higher using this definition than when using the legal definition.

Figure 3: The rise in non-regular work in Japan

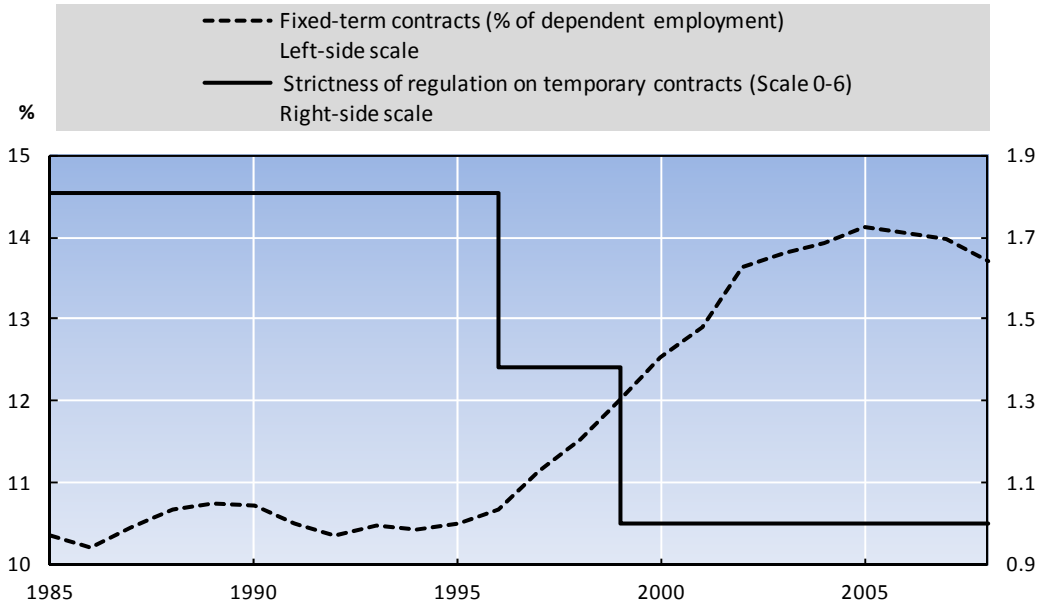


Source: Japan Statistics, Labour Force Survey, Historical data.

10. The usual explanation for the rise of non-regular work centres on the increased need for employment flexibility. It is asserted that due to globalisation and technological change, product market competition and market volatility have increased. In order to deal with this increased volatility in output markets, it is argued that firms need more employment flexibility. As a result, incentives to commit to

worker-firm matches have eroded on both sides, undermining incentives to invest in firm-specific human capital, and consequently, the effectiveness of the long-term employment system. The increased need for employment flexibility and rising concerns about the effectiveness of the long-term employment system have motivated demands to liberalise the market for temporary work. This resulted in two reforms in 1996 and 1999, which gradually removed restrictions on the use of dispatched workers across occupations and sectors.[5] Figure 4 relates the rise in non-regular work based on the legal definition – the appropriate definition in the context of employment protection rules – and the OECD's Employment Protection Index for temporary work. It shows that the 1996 reform coincides with the start of the rise in non-regular work.

Figure 4: The rise of fixed-term contracts and the regulation of temporary contracts



Source: Japan Statistics, Labour Force Survey, Historical data and *OECD Employment Protection Database.*

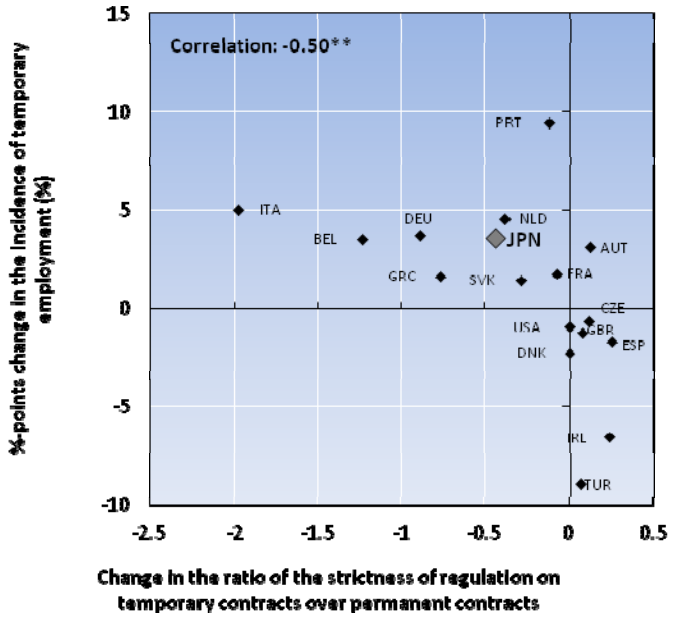
11. In order to get a better sense of the importance of the labour market reforms in the late 1990s and their potential consequences for labour market duality, figure 5 relates the change in the incidence of temporary work between 1995 and 2005 to changes in the ratio of employment protection for temporary workers to that of permanent workers. It shows that the incidence of temporary work has increased in most countries, while the relative stringency of employment protection for temporary workers has tended to fall in many countries. Moreover, the rise in the incidence of temporary work tends to be larger in countries

5 . Persons employed by temporary worker agencies (TWAs) who are sent to firms on fixed-term basis.

where the relative stringency of employment protection has tended to decline more, resulting in a negative relationship.[6] These findings are in line with theoretical models in the literature that suggest that a high gap between temporary and permanent employment protection not only increases incentives to create temporary jobs but also reduces incentives to convert temporary into permanent contracts and hence labour market duality (Bentolila *et al*., 2010; Boeri, 2011).

Figure 5: The incidence of fixed-term contracts and the regulation of temporary contracts

Difference between 1995 and 2005



Source: OECD Labour Force Statistics and *OECD Employment Protection Databases.*

12. In sum, the incidence of non-regular work in Japan has increased substantially during the last 25 years. This seems to reflect at least two important developments: i) a long-term trend of increasing labour market formalisation, spurred in part by product market reforms; ii) the liberalisation of temporary work

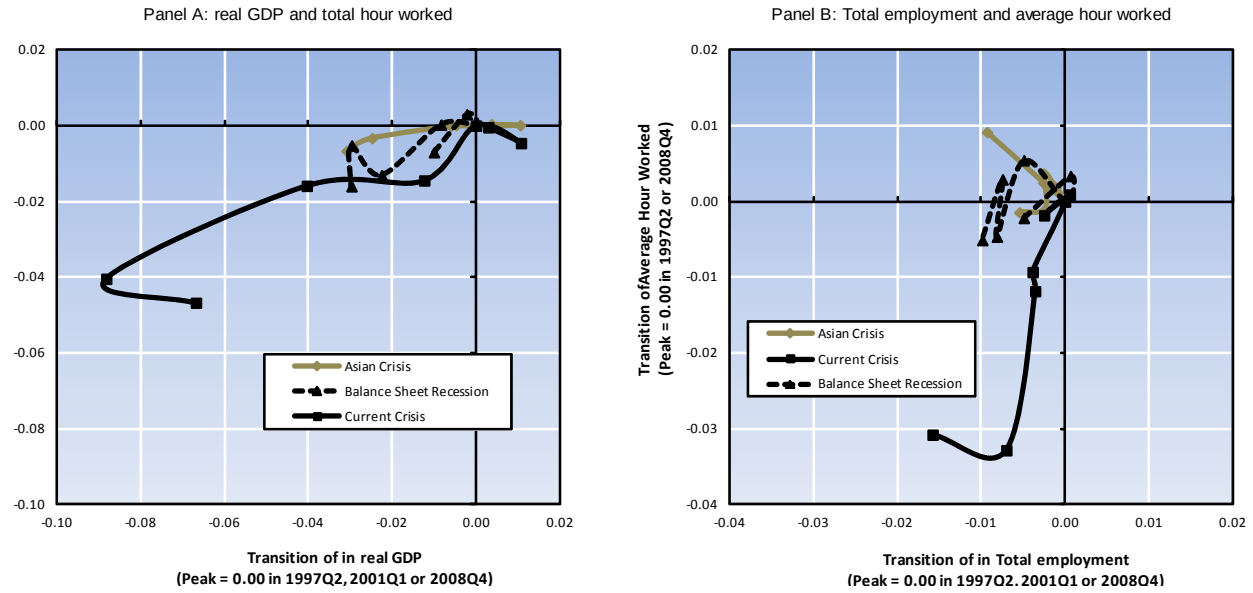
6. The correlation coefficient is -0.5 and statistically significant.

during the period 1996-2005, in part motivated by demands for greater employment flexibility and concerns about the effectiveness of the longterm employment system.[78]

2.2 Labour market development during the Current Crisis and its implication

13. The labor market reforms should be expected to result in behaviours in labor markets. The figure 6 draws the evolution of real GDP and total hours worked in a panel A and the evolution of total employment and average hours in panel B. To compare them from the start of the Asian Crisis, the Balance Sheet Recession and the Current Recession, we normalize them as zero at the peak of real GDP; namely 1997 Q2, 2001Q1 and 2008 Q4.[9]

Figure6: The evolution of GDP and total hours worked in the Asisan Crisis, the Balance Sheet Recession, and the Current Crisis (2 quarters before and 4 quarters after peaks)



7 . According to a 2007 business survey, employment flexibility and labour costs were cited as the most important reasons for the rising incidence of irregular work (OECD, 2011). Over 50% of firms indicated that they hired non-regular workers to cope with fluctuations in daily or weekly demand and facilitate adjustment to business fluctuations.

8. An additional factor is the expansion of private business of human resource managements. Not only recruit and dispatch of workers, but also displacement workers (Bognanno and Delgado, 2008).

9 . The series are seasonally adjusted by ARIMA-X(12). After taking logs, they are detrended by HP filter with smooth parameter of 1600.

Source: OECD Main Economic Indicators Database.
The peak is 1997 Q2 for Asian Crisis and 2008 Q4 for Current Crisis

14. The figure clearly shows, in Panel A, that the relation between real GDP and total hours worked is somewhat similar between the Asian Crisis, the Balance Sheet Recession and the Current Crisis, though the magnitude of transition was much bigger in the last case. On the other hand, the adjustment method seems to be different among three in Panel B. During the Current Crisis, the labor input adjustment is likely to rely *more* on average hour adjustment rather than changing the number of body. Considering that the negative shock continued shorter in the former crisis than in the recent one, it is at least unclear that adjustment behaviour has been changed.

15. The panel may be contradicting to the increase in non-regular workers. The relaxation of regal rules related to the hiring of temporary workers in figure 4 will reduce the cost of hiring temporary workers relative to that of permanent workers and, by increasing the incidence of temporary work, increases the scope for making downward adjustment on temporary employment. One would expect the liberalisation of the market for temporary work to increase both hires and separations of temporary workers at the expense of permanent workers, thereby increasing the flexibility of employment and consequently reduces pressures to make adjustments in terms of working hours (or hourly wage). This is what we do not find in the published statistics during the Recent Crisis as in figure 6.

16. Above macro economic summary, however, lacks two important aspects on the adjustment bahaviors; that is, the distribution and asymmetricy of adjustment behaviors. The heterogeneity of each employers and employees plays much more important role in recent economy than before, due to the changes in technologies and economic environments. Previous literature in labor adjustments has also found the distinction of heterogeneity between sectors and/or idiocyncratic factor of each player is necessary to shape the aggregated labor flows (Davis and Haltiwanger, 1989), which is also important to assess the implications on labor market resilience. In addition, the adjustment behaviour in employment is totally different from toward negative direction to toward positive direction, mainly because of fixed cost. It is ambiguous which side of behaviour the insititutional change in non-regular workers affected. The simple aggregated statistics such as in figure 6 is likely to cancel each of different micro economic behaviours and produce an smooth transition from time to time, and it does not help to deduce the implication of increase in non-regular workers on adjustment behavior.

17. In order to assess the implications of the rising incidence of non-regular work for labour market resilience, one first needs to analyse its implications for the adjustment behaviour of firms at the micro-economic level, the main focus of the present paper. By carefully aggregating changes in firm adjustment

behaviour in response to shocks, one can assess the implications of the rising incidence of non-regular work for macro-economic aggregates such as employment, including hiring and separations and average hours and indirectly for unemployment.

3. Methodology

18. The methodological framework in this paper builds on previous work by Davis *et al.* (2006, 2011) who empirically analyse the relationship between worker and job flows in the cross-section and over time. Their main findings is that, first of all, it is shown that the relationship between hires and layoffs, on the one hand, and net employment changes, on the other, is highly non-linear in the cross-section; that these relationships are stable over time; and that, as a result, shifts in the cross-sectional distribution of employment growth allow one to explain to explain aggregate hiring and firing dynamics pretty well. This is in line with the tight link between job and worker flows implied by standard search models of the labour market. However, these same models do not appear to explain aggregate variations in quits very well, suggesting that the relationship between quits and employment changes depends on the business cycle. Secondly, rather than assuming that the relationship between job and worker flows is the same for all establishments, they also investigate the importance of differences in the adjustment technology across different types of firms. Controlling for differences in adjustment technology for assessing the aggregate implications of shocks is essential when shocks are heterogeneous, *i.e.* shocks affect labour demand more in certain firms than in others. In addition, it is implies that how recent changes in employment protection regulations may have affected the labour input adjustment behaviour of firms to shocks and assess its implications for aggregate labour market dynamics.

19. We extend their methodological framework in that, rather than conditioning on employment shocks, the present analysis also considers shocks in total hours worked. This allows one to study not just the relationship between job and worker flows but also the role of average hours changes for adjusting to shocks. The adjustment by average hour worked has been examined as one of main issues in labor economics (Abraham and Houseman, 1994; Hamermesh, 1993). Partially due to the availability of data and partially due to the constraint of theoretical model, search theories tend to lack the aspect of hour adjustments. In reality, the hour adjustment has been continued to be an important resort to negative shocks, for example, the effectiveness of shorttime work during the Current Crisis (OECD, 2010). This is also important in the present context, because the reforms in the labour market may not only have affected the

way establishments adjust employment levels but also the relative importance of adjustments on the intensive and extensive margins.

Decomposing labour input adjustment

20. In order to analyse the way the firms adjust to shocks it is useful to start by decomposing total hours worked (L) as follows:

(1) $L = NQ$

where *N* refers to employment and *Q* to average hours worked. Totally differentiating (1) and multiplying both sides by $\frac{L}{\bar{L}}$ yields the growth rate of total hours:

(2) $\frac{\Delta L}{\bar{L}} = \frac{\Delta N}{\bar{L}}\frac{L}{N} + \frac{\Delta Q}{\bar{L}}\frac{L}{Q}$

Bars refer to the average between the current and previous period. In cluding the distinction between hiring and separation, equation (2) can be rewritten as:

(3) $\Delta l = Q(h - s) + N\Delta q$

where *l* refers to the growth rate in total hours, *h* to the hiring rate, *s* to the separation and Δq to the growth rate in average hours worked ($\frac{\Delta L}{\bar{L}} = \Delta l;\ \frac{\Delta N}{\bar{L}} = h - s, \Delta q = \frac{\Delta Q}{\bar{L}}$). Our empirical investigation is to examine the effect of labor demand shock on each of *h*, *s*, and Δq.

Analysing the micro-economic behaviour of establishments in response to shocks

21. In order to analyse the role of labour demand shocks for labour input adjustment one may proceed either non-parametrically or parametrically. Both methods will be used in this paper. The advantage of non-parametric methods is that it avoids having to make assumptions about the functional form of labour input adjustment with respect to shocks. The advantage of parametric methods is mainly that it allows for a more parsimonious representation. The two methods are applied for the entire of sample of establishments as well as separately for clusters of establishments who likely to share a common adjustment technology. Clusters may refer to, for example, different sectors or firm-size groups.

22. The non-parametric method to analysing the relationship between labour input adjustment and changes in total hours worked is implemented by dividing the distribution of the growth rate of total hours into narrow growth intervals, g. This involves assuming that within growth rate interval g the average

adjustment response depends linearly on the size of the shock. More specifically, the adjustment behaviour of establishments is analysed using the following empirical model of the relationship between the growth rate in total hours and adjustments in margin *x* with being either *h*, *s* or Δq:

(4.1) $$x_{it} = \alpha_i + \sum_{g=1}^{G} \beta^g D_{it}^g + \varepsilon_{it}$$

where α_i refers to an establishment fixed effect, β^g relates the within-establishment variation in *x* to being in growth interval *g*, D^g to a set of growth interval dummies ("bin dummies") and ε_{it} to a random error term. The empirical model is similar to that used by Davis *et al.* (2006, 2011) The main difference with their approach is that the analysis here conditions on the growth rate of total hours instead of that of employment. This allows one to also consider adjustment functions of average hours. It is worth noting that predicted values of *x* are time-invariant within the sample period since the right-hand side does not include any time-varying information. [10]

23. The parametric method involves assuming that labour input adjustment is linear in the growth rate of total hours over the entire negative domain and the entire positive domain.[11] Thus, one may represent labour input adjustment in response to the growth rate of total hours worked as follows:

(4.2) $$x_{it} = \alpha_i + \beta^n \Delta l_{it} I(\Delta l_{it} < 0) + \beta^p \Delta l_{it} I(\Delta l_{it} > 0) + \beta^0 + \varepsilon_{it}$$

where *I(.)* is an indicator function that takes the value of one if the expression in brackets is true and zero otherwise. β^n measures the responsiveness of factor *x* with respect to negative values in the growth rate of total hours, that is, in shrinking establishments, whereas β^p measures the responsiveness of factor *x* with respect to positive values in the growth rate of total hours, that is, in expanding establishments. Bellman *et al.* (2011) use a similar specification to analyse the link between job and worker flows in Germany. β^0 represents a constant term.

4. Data

24. The analysis makes use of data from the *Monthly Labour Survey* (hereafter, MLS) and *Employment Trend Survey* (hereafter, ETS) for the period 1994-2009. MLS is a monthly establishment

10 . The analysis does not include any time-dummies since time-fixed effects are unobservable and therefore do not enhance the predictive power of the empirical model in the simulation analysis.

11 . Figure 7 in Section 4 makes clear why this specification is reasonable for Japan.

survey, similar to JOLTS in the US, that provides information on employment, gross hires and separations, total hours (divided by scheduled part and overtime), total wage bills (divided by scheduled part, overtime and bonus). Since the survey is designed for a prompt report on economic activities, it does not include details of flows. On the other hand, ETS, a less-frequet establishment survey (twice a year), reports the details of acquisitions and separations thourgh coordinated surveys of hired worker themselves and of human resource managers. By using the information of separation from ETS, we can distinguish two flows of layoff and quit.

4.1 Monthly Labour Survey

25. The data of MLS can be broken down by gender or workplace title (regular/non-regular). The raw data contains on average 33,000 establishment observations each month. The survey covers all establishments with five employees or more. It covers all market sectors except agriculture and fisheries. The full sample for the period 1991-2009 consists of 5,796,618 establishment-month observations. The monthly data are transformed into quarterly ones to make the dataset more manageable, following the cleaning process as in the appendix. The final dataset consists of 1,508,162 establishment-quarter observations.

26. The sampling of the Monthly Labour Survey is relatively complex due to the role of rotation. The sample consists for 50% of establishments with 30 or more employees and for 50% of establishments with less than 30 employees. For establishments with more than 30 employees, a completely new sample is used every two or three years (referred to as a "major" rotation below). This new sample is followed every month until a completely new sample is selected. Establishments that leave the sample during the period are replaced by new ones from the sampling frame. For establishments with less than 30 employees, the sample rotates every six months so that one third of establishments below 30 employees leaves the sample, two thirds continue and one third enters (this represents a "minor" rotation). This implies that such establishments are followed for a period of 18 months until they rotate out of the sample. New establishments are selected using stratified random sampling. The strata are defined in terms of industry and establishment size. Accordingly, sampling weights vary by month, industry and establishment size.

27. All relevant data series are adjusted to account for seasonal fluctuations and any fluctuations related to major rotations in the sample. The fluctuations at major rotations arise because the measurement of labour market flows requires two consecutive quarters of data which are not available for large firms that just entered the data after a major rotation. The adjustment procedure is similar for each type of fluctuation. The adjustment procedure involves the following steps. First, the predicted mean within each quarter or major rotation point and each year, $\widehat{y_2}$ is retrieved by regressing each variable on N quarter

dummies (N=4) or N major rotation dummies (N=2) without a constant. Each variable is then adjusted by subtracting from each observation the adjustment term $\widehat{y_2} - \widehat{y_1}$. Figure B1 in the Annex presents the aggregate evolution of the growth rates in employment in total hours based on the data used for this paper and the official statistics.[12] The figure shows that the two series tend to track each other reasonably well, particularly in the second half of the sample.

4.2 Employment Trend Survey

28. The body of Employment Trend Survey consists of gross flow information during half a year. Over 10,000 establishment over 5 employees are sampled every year from the every industry except for agriculture and fisheries, and every over-500 establishment is sampled every year. Once sampled, establishments report, twice a year, the stock of employment and gross flows during 6 month. In addition, the individual survey is conducted to the re-sampled individual workers (around 80,0000 hirings) who are newly hired in the establishments, asking the attributes of themselves and their behaviour during job transition. Since they cannot track separated workers, the survey requires the human resource managers of establishmemts to classify particular separations by its gender, age, tenure, its reason and so on (around 80,0000 hirings).

29. By using the reason of separation, we classify layoff and quit among separation. Layoffs are defined as separations due to 'Expiry of the contract,' 'Due to circumstances of the management,' 'Retirement age', 'Due to personal fault.' Quits are defined as separations due to 'Personal reasons[13].' The remaining is the separation due to the transfer within and between firms.

30. The difference between MLS and ETS is that ETS has neither panel structure nor total hour variable. Therefore, ETS is used at most supplementarily to produce statistics based on employment changes. MLS will provide the unique observation based on total hour change.

5. Descriptive Statistics

12 . The actual series are obtained by first taking the quarterly averages of each variable and then averaging across establishments using the sampling weights. For the purposes of presentation, a three-month moving average is taken of both the official growth rates and the growth rates aggregated up from the micro data.

13. The detailed categories of 'Personal reasons' has been changed from time to time, adding the new categories such as 'Marriage,' 'Maternity/child care,' 'Long-term care,' and 'Other personal reasons.'

31. As discussed in the previous section, the econometric analysis proceeds both non-parametrically and parametrically. For the non-parametric analysis, establishments are divided into growth intervals or "bins". More specifically, the growth distribution of employment and total hours is divided into 50 bins that each account for about 2% of the overall sample. In practice, this implies that bins are wider at the extremes of the distribution (the closer to -2 and 2) and smallest around zero. The start and end points of each bin are time-invariant. In order to analyse the adjustment behaviour across establishments that differ in their adjustment technologies and to control for the potential role of shock heterogeneity in the simulation analysis, establishments are regrouped in cells based on industry and firm size. The implicit assumption is that within industry and firm size cells, establishments share a common adjustment technology. The analysis considers 45 cells based on nine one-digit industries of the Japanese Standard Industrial Classification (1997) and the five firm-size classes (5-29; 30-99; 100-499; 500-999; 1000+).

Employment Change

Table 1(a). **Summary statistics based on employment size change (yearly ETS)**

	Employment Change				
	<-0.2	**-0.2>= & -0.1**	**-0.1>= & -0.1<=**	**0.1> & 0.2<=**	**0.2>**
Mean of employment characteristics					
average employment	202.69	248.94	432.71	220.45	193.96
share of non-regular workers	0.064	0.083	0.063	0.083	0.098
Industry Shares					
manufacturing	0.53	0.54	0.53	0.44	0.43
construction	0.07	0.06	0.06	0.08	0.09
retail, wholesale, restaurant	0.08	0.09	0.07	0.08	0.09
other service	0.22	0.22	0.25	0.31	0.29
others	0.10	0.09	0.09	0.08	0.10

Source: Authors' calculations based on Employment Trend Survey
Footnotes: Non-regular workers are defined as short-time workers in the establishments.

32. Table 1(a) shows the average employment size and average share of parttimers for each of employment change category from ETS. The distribution of establishment size (in terms of body) is heavily skewed, and large size establishments are unproportionally concentrated between small employment changes. The share of non-regular workers is larger in expanding establishment rather than shrinking establishment for the tail of distribution. However, the share of non-regular workers does not exhibits monotonic relation to employment change. The industry composition slightly relates to the employment change. There are more manufacturing in shrinking establishments and more other services in expanding establishments. As is previously claimed, ETS includes every establishment over 500 and this sampling property will skew the industry distribution to manufacturing which has more large size establishments than in other industries.

Total Hour Change

Table 1(b). **Summary statistics based on total hour change (Quarterly MLS)**

	Total Hour Change				
	<-0.2	**-0.2>= & -0.1**	**-0.1>= & -0.1<=**	**0.1> & 0.2<=**	**0.2>**
mean of employment characteristics					
average employment	87.8	162.2	204.8	158.9	108.0
share of non-regular workers (# of employment)	0.227	0.183	0.174	0.186	0.239
mean of hour worked characteristics					
average hour worked	141.8	152.5	161.5	169.4	169.4
share of overtime	0.039	0.048	0.053	0.057	0.059
share of non-regular workers (total hour)	0.178	0.142	0.135	0.143	0.187
mean of wage characteristics					
average log of hourly wage	2.88	3.45	3.59	3.33	3.33
average log of hourly wage (regular workers)	3.24	3.75	3.89	3.61	3.71
average log of hourly wage (non-regular workers)	1.27	1.19	1.24	1.22	1.36
Industry Shares					
manufacturing	0.34	0.35	0.33	0.34	0.32
construction	0.12	0.07	0.06	0.07	0.11
retail, wholesale, restaurant	0.17	0.18	0.19	0.18	0.18
other service	0.27	0.28	0.29	0.29	0.29
others	0.09	0.12	0.13	0.12	0.11

Source: Authors' calculations based on Monthly Labor Survey
Footnotes: Non-regular workers are defined as short-time workers in the establishments.

33. Related to total hour change, MLS shows that the distribution of establishment size (in terms of body) is also skewed, and large size establishments are likely to be concentrated between small total hour change. Actual average hour worked is now positively correlated to total hour change, partially because of the ovettime adjustment and the share of non-regular workers. Industry compostion is stable. Manufacturing occupied around 30%. Service and retail industries compose half of sample in total. Because neither the share of non-regular workers, the overtime adjustment nor the industry composition does not fully explain the cross sectional variation in the level of average hour, these figures imply the hour adjustment behaviour is the general response to the shocks by the Japanese establishments.

6. Micro-economic analysis of labour input adjustment

6.1 Aggregate analysis of labour input adjustment with an homogenous technology

34. This section presents two sets of results: i) parametric and non-parametric results on the aggregate relationship between labour input adjustment and labour demand shocks; and 2) parametric

evidence on the importance of heterogeneity in adjustment technologies across different types of firms. The non-parametric analysis of the relationship between labour input adjustment and labour demand shocks allows one to determine which, if any, parametric restrictions may be justified by the data so as to simplify the analysis of non-regular work for labour input adjustment. The analysis of adjustment technologies across different classes of establishments allows one to determine to what extent it is important to control for this type of heterogeneity in the regression analysis as well as in the simulations.[14]

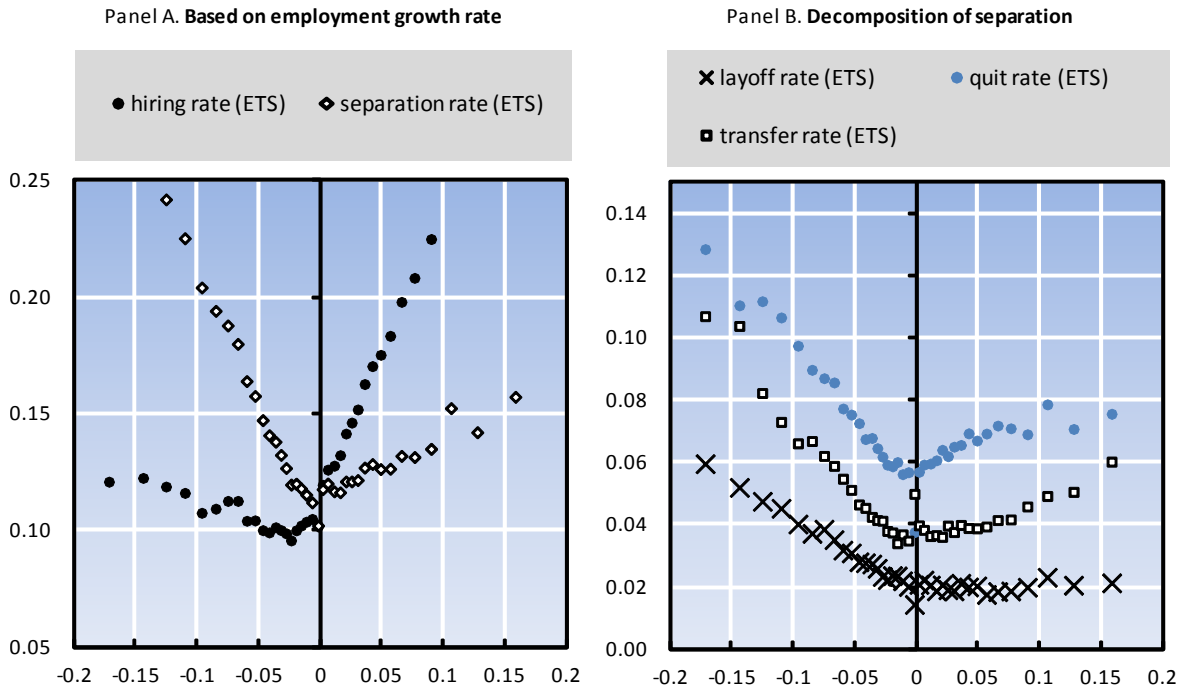
Employment Change

35. Figure 7 presents non-parametric evidence, based on the so-called bin method described in Section 3, on the relationship between gross employment adjustment and net employment changes. On the holizontal line, instead of bin number, the average employment growth rate of each bin is gripped, and on the vertical line, the estimated coefficients of each bin (β^g) are plotted. As we mentioned, the employment change analysis is based on yearly ETS and the coefficients are estimated by weighted OLS without establishment fixed effects.[15] Panel A, represents the decomposition of employment growth into hiring and separation, and panel B exhibits the decomposition of separation behaviour into layoff, quit and transfers. For simplicity, we limit the domain between -0.2 and +0.2, which excludes extreme values for the first three and the last two bins.

Figure 7. **A decomposition of hiring and separation behavior in employment change**

14. In the regression analysis, one can control for this type of heterogeneity by including for establishment fixed effects

15. We do not control, here, for industry, firm size and prefecture to avoid the result exhibits for a particular industry, firm size in particular prefecture.



Source: Authors' calculations based on Employment Trend Survey

36. As the population of each bin occupies 2%, it is easily shown that the change in employment is highly concentrated in a domain around zero. The figures show the important characteristics of employment change in general; namely, 'kink' and 'churning.' Panel A shows that the relationships between hiring (separation) rates and employment changes exhibit sharp kinks near zero. For example, from 25th bin to 26th bin (24th bin includes most of zero change), the average employment growth increases by 0.41% point, while the average hiring rate of bin rises up by 0.65% point (separation rates also rises up by 0.24% point). On the opposite side of zero change, from 23rd bin to 22nd bin, the average employment growth decreased by almost the same magnitude of the other side, by 0.47% point, but the decrease in hiring rates is only by 0.12% point (increase in separation rates is by 0.33%). The elasticity of hiring (or separation) and separation to employment change is discretely different between the left side and the right side of zero change.

37. The kinks in two functions may reflect the fact that it is less likely to reduce employment by reducing hiring rather than by increasing separations and that it is less likely to increase employment through reducing separations than by increasing hiring.[16] However, the hiring or the separation is broadly

16. This interpretation is based on the classical labor demand theory which deduces the hiring as the result of labor demand shock. Because we take the employment change as independent variable in this section, the hiring and the separation are mutually dependent by construction. Therefore, we do not identify the

linear within each of the negative or positive domain. The approximately linear relationship between job and workers flows on the positive and negative domains implies that a parametric approach that imposes linearity, but allows the slope coefficients to differ between the negative and the positive domain, is likely to describe the relationship between worker and job flows fairly well.

38. For establishments with no change in employment, we observe yearly hiring and separation rates of about 10-11%. Abowd *et al.* (1999) reports an annualised churning rate of approximately 20% for France, Bellman *et al.* (2011) 16% for Germany and Davis *et al.* (2011) 8% for the Unites States. Thus, the churning rate appears to be slightly smaller in Japan than in France and Germany and slightly larger than in the United States. This suggests that churning in Japan plays a fairly important role in accommodating changes in employment. This is quite striking once one realises that the layoff rate has traditionally been relatively low due to the importance of the longterm employment system. Given the low tendency to layoff, the relative importance of churning in total job reallocation may reflect the low level of job reallocation, due to, for example, hiring and firing costs (Teruyama and Genda, 2009).

39. Few reliance on layoff can be confirmed in Panel B, where layoff rates are under quit rates in all bins. However, it is worthy to mention that, in the huge shrinking establishments, layoffs take a significant role in separation. In addition, there remains around 2% layoff rates even in non-contracting establishments; which means a non-neglisible role of layoff to reallocate job opportunity within establishments. As a whole, in the Japanese labor markets, employer-initiated separations sometimes become a major choice to control the job reallocation, especially when employers reduce the huge amount of employment. Instead of layoffs, quits and transfers constitute the majority of churnings in both of expanding and shrinking establishments. Especially quits seems to be positively related to the amount of employment changes.

40. Parametric estimates of the relationship between establishment growth and adjustment behaviour provide a similar picture and confirm the intuitive discussion above. Table 1 summarises the results based on the employment growth distribution for both the entire sample and a sample that is restricted to the growth rates of –10% to 10%. Full sets of results can be found in Annex table A1.

Table 2. **Aggregate parametric results (employment change)**

determinants of hiring from those of separation. However, the kink of function and the existence of churning behaviour is free from this discussion of identification.

Panel A. Decomposition of **hiring/separation behavior**

	Positive regime (β^p)	Negative regime (β^n)	Constant
Full sample			
Hiring rates	1.259	-0.037	0.112
Separation rate	0.259	-1.037	0.112
Resticted sample (-10% to 10% change)			
Hiring rates	1.454	0.206	0.112
Separation rate	0.454	-0.794	0.112

Panel B. **Decompostion of separation behavior**

	Positive regime (β^p)	Negative regime (β^n)	Constant
Full sample			
Quit rates	0.094	-0.206	0.060
Layoff rate	0.037	-0.251	0.019
Transfer rate	0.125	-0.580	0.034
Resticted sample (-10% to 10% change)			
Quit rates	0.306	-0.307	0.053
Layoff rate	0.040	-0.206	0.019
Transfer rate	0.109	-0.282	0.041

Source: Authors' calculations based on Employment Trend Survey
Footnotes:Fullsets of estimated results can be found in Annex Table A1.

41. The kink in functions are easily found in that the absolute value of β^p and β^n are totally different each other in either specification. In addition, differences in the results between from the entire sample and from the restricted sample reflect non-linearities in the relationship between employment growth and labour input adjustment. These non-linearities may be genuine or driven by measurement problems at the extreme ends of the growth distribution. Note, however, that the restricted sample includes approximately 80% of all observations and therefore still provides a very reasonable indication of the adjustment behaviour of most establishments.

42. The churning behaviour is confirmed as the constant of functions of about 11.2%. Interestingly, the separation decomposition in Panel B exhibits voluntary quits can explain almost half of churning flows (5.3-6.0%). The remaining half is due to transfers (3.4-4.1%) or layoffs (1.9%), which is initiated by employers. These findings suggest churning flows are the results from workers' voluntary quit as much as the consequence of the job reallocation activated by employers.

43. In addition to kink and churnings, within a small changes, establishments that increase employment rely exclusively on increased hiring while establishments that reduce employment rely on a combination of increased separations and reduced hiring (*i.e.* attrition). The former seems to be natural because the hiring function is positive relation with employmwnt growth. However, the hiring rate is also a positive function of employment growth on the negative domain, implying that employment reductions of 10% are achieved through a 7.9% increase in the separation rate and a 2.1% reduction in the hiring rate in the restricted sample. It is valuable to note that the reducing hiring is a substantial option for the Japanese employer to reduce employment in small changes.

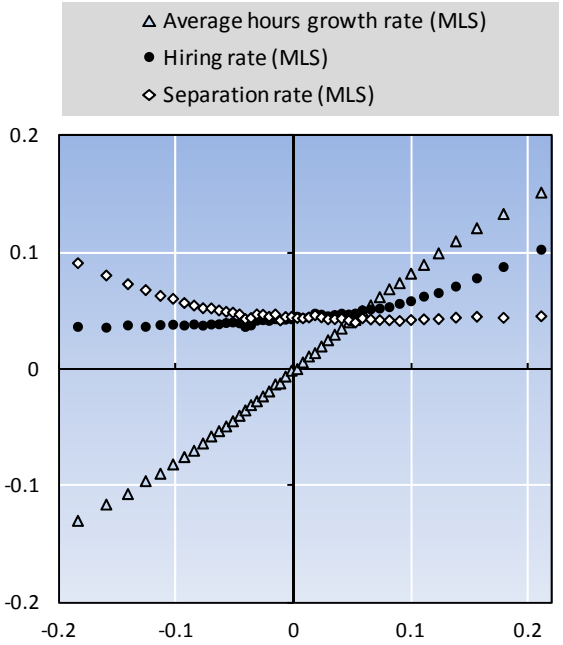
Total hour change

44. Although the decomposition of employment change is informative to know the actual hiring/separation behaviours in labor markets and make an idea to intrude the labor market mechanisms, it is difficult to find an economic causality in it. Now we move to the decomposition of total hour change

based on MLS data. On the one hand, MLS lacks the information on the reasons of separation, the decomposition by total hour change is more useful in that the relation between hiring/separation and total hour change is not trivial any more and it reflect the relative adjustment costs between adjustment of number of body and adjustment of labor hour.[17]

45. The next Figure 8 presents non-parametric evidence on the relationship between the hiring rate, the separation rate, the growth rate in average hours and the growth rate of total hours worked. Here we apply (4.1) directly to quarterly MLS data and plotted the estimated coefficients bin by bin. The horizontal line is the average total hour change in each bin as in the employment change version. For simplicity, we limit the domain between -0.2 and +0.2, which excludes extreme values for the first and last three bins.

Figure 8. **A decomposition of labour input adjustment in total hour change**



Source: Authors' calculations based on Monthly Labour Survey

46. We also find the 'kink' and 'churnings' in total hour change. But the kink in total hour change is more smooth. For example, from 26th bin to 27th bin, the average total hour change of bin increases by 0.49% point, while hiring (separation) rates increases (decreases) by 0.21% (0.09%) point. On the other hand, between 26th and 25th bin, with the 0.51% point decline of total hour change, hiring (separation) rate decreases (increases) by 0.04% (0.03) point. These considerations may induce a discussion about continuous but non-linear functions. Figure 8, actually, shows a S-shaped relationship between the chang in average hours worked and the growth rate of total hours worked: average hours adjustment is relatively

17. In this article, we do not derive the structural form of hiring/separation functions, but continue the discussions based on more intuitive interpretations of statistics.

more important for small changes than for large changes in total hours. More specifically, for small proportional increases (decreases) in total hours worked, the slope of the average hours curve is steeper than that of the hiring rate (separation rate), while for large increases (decreases) the slope of the average hours curve is flatter than that of the hiring rate (separation rate). Change in average hours growth are effectively zero on average for establishments in which total hours worked are constant. A somewhat similar S-shaped relationship has also been documented for the United States in Caballero *et al*. (1997). [18]

47. Furthermore, it is worth noting that even very large changes in total hours worked, for example, changes as large as 50% of establishments' total hours worked, adjustments in average hours worked account for more than half the change in total hours. For low growth rates of total hours worked, the growth rate in the average hours rate accounts for almost the entire change. For establishments reducing total hours by 5% changes in average hours worked account for about 80% of the total change. Average hours changes account for over 85% of total hours changes of about 2.5% and about 99% of total hours changes of 1%. This implies that aggregate shocks that are approximately evenly distributed across establishments tend to be accounted for to a greater important extent by average hours adjustments than shocks that affect certain establishments more than others. This highlights the importance of accounting for the distribution of shocks in addition to its mean level when trying to explain cross-country patterns in labour market adjustment. While internationally comparable evidence is not available, it is likely that the importance of average hours adjustments in total hours adjustments is higher in Japan than in most other countries.[19]

Table 3. **Aggregate parametric results (total hour change)**

	Positive regime (β^p)	Negative regime (β^n)	**Constant**
Full sample			
Hiring rates	0.391	-0.011	0.033
Separation rate	0.062	-0.429	0.031
Average hours worked	0.680	0.590	-0.003
Resticted sample (-10% to 10% change)			
Hiring rates	0.125	0.078	0.039
Separation rate	-0.030	-0.108	0.040
Average hours worked	0.846	0.810	0.000

Source: Authors' calculations based on Monthly Labour Survey
Footnotes:Fullsets of estimated results can be found in Annex Table A2.

18. Taking the exponent of the growth rate of average hours renders the relationship between average hours and the growth rate of total hours almost linear.

19. Macro-level statistics certainly suggest this is the case. See, for example, OECD (2010). In addition, in the macro-level regression shows weaker asymmetricity between positive and negative adjustments.

48. The parametric estimates provide three main insights. First, the role of average hours adjustment in total hours adjustment is large. Average hours changes account for 68% of changes in total hours on the positive domain (85% using the restricted sample) and 59% of changes in total hours on the negative domain (81% using the restricted sample). The reason for the larger role of average hours in the restricted sample is that average-hours adjustments play a more important role for small changes in total hours. The larger role of average hours adjustment on the positive than on the negative domain is more difficult to explain. This may reflect the poor macro-economic performance during much of the sample period: establishments that are expanding may be reluctant to hire new workers as they do not have sufficient confidence that the expansion will last (see results by year below). Or adjustment floor by scale economy in labor hour.

49. Second, differences in the results for the entire and the restricted samples reflect non-linearities in the relationship between growth and labour input adjustment. These non-linearities may be genuine or driven by measurement problems at the extreme ends of the growth distribution. Note, however, that the restricted sample includes approximately 80% of all observations and therefore still provides a very reasonable indication of the adjustment behaviour of most establishments.

50. Third, within a small change, establishments that increase labor inputs rely exclusively on increased hiring while establishments that reduce total hours rely on a combination of increased separations and reduced hiring (*i.e*. attrition). The hiring rate is also a positive function of total hour change on the negative domain, implying that total hour reductions of 10% are achieved through a 1.1% increase in the separation rate and a 0.8% reduction in the hiring rate (remaining 8.1% is achived by decreasing average hour). It is valuable to note that the reducing hiring is a substantial option for the Japanese employer to reduce total hour, too.

6.2 Analysis of adjustment behaviour across types of establishments and of workers

51. Since the results based on the parametric and non-parametric approaches tend to be similar, the analysis of variations in adjustment behaviour across establishment types and over business cycle concentrates exclusively on the more compact parametric approach. In the interest of space, the results are only reported for adjustments to positive and negative total hours changes. Firm size is defined at the starting point of each establishment and fixed overtime.

Table 4. **Aggregate parametric results by firm size, industry and employment status (<u>total hour change</u>) Restricted sample (-10% to +10% change)**

	Panel A. Hiring Rates			Panel B. Separation Rates			Panel C. Average Hour Worked		
	Positive regime (β^p)	Negative regime (β^n)	Constant	Positive regime (β^p)	Negative regime (β^n)	Constant	Positive regime (β^p)	Negative regime (β^n)	Constant
Firm size class									
5-29	0.117	0.090	0.037	-0.047	-0.130	0.037	0.838	0.775	0.000
30-99	0.133	0.067	0.041	-0.054	-0.123	0.043	0.815	0.806	0.001
100-499	0.124	0.064	0.040	-0.033	-0.117	0.041	0.847	0.815	0.000
500-999	0.117	0.078	0.039	-0.012	-0.082	0.039	0.870	0.837	-0.001
over 1000	0.142	0.066	0.042	0.001	-0.083	0.042	0.861	0.846	0.000
Industry									
Manufacturing	0.082	0.043	0.027	-0.046	-0.102	0.029	0.875	0.850	0.002
Other service	0.163	0.097	0.046	0.015	-0.094	0.044	0.850	0.806	-0.003
Retail, Wholesale & Restaurants	0.128	0.097	0.052	-0.062	-0.127	0.054	0.814	0.767	0.000
Construction	0.136	0.093	0.033	-0.033	-0.124	0.035	0.827	0.774	0.000
Employment Status									
Regular	0.093	0.063	0.028	-0.028	-0.089	0.030	0.877	0.835	0.000
Non-regular	0.183	0.069	0.054	-0.029	-0.110	0.056	0.762	0.798	0.002

Source: Authors' calculations based on Monthly Labour Survey
Footnotes:Fullsets of estimated results can be found in Annex Table A3.

52. The role of firmsize does not appear to play a very important role in determining the way establishments accommodate changes in employment (not reported). However, the role of establishment size does appear to play an important role for the way establishments accommodate changes in total hours worked, that is, in the relative importance of adjustments on the intensive and extensive margins. Large firms rely to a much greater extent on average hours adjustments to increase total hours worked than small firms, especially when they decrease total labour inputs. Difference in reliance on hour adjustment between positive regime and negative regime is narrow in larger firm. For example, in the largest firm, 84.6% (NEG) and 86.1% (POS), whereas in the smallest firm, 77.5% (NEG) and 83.8% (POS).

53. Industry affiliation plays a substantial role for the adjustment behaviour of establishments. The role of average hours adjustments in negative hours adjustments is most important in manufacturing, while it is also relatively high in manufacturing establishments that expand total hours. This is likely to reflect the relative importance of match-specific human capital in manufacturing. There is also some indication that manufacturing establishments that reduce employment rely more heavily on reducing replacement hiring (attrition) than establishments in other industries.

54. Generally, adjustment behaviours of regular and non-regular workers are different. Here we regress hiring/separation and average hour change on total hour change of each title. In other words, given the total hour change of each title, we compare the composition of the adjustment methods as in Table 4.

55. The difference in adjustment behaviour between regular and non-regular workers is twohold. Firstly, it is found mainly in the role of average hour. On average, almost 88% of total hour increase is

absorbed by increasing average hour in regular workers where as it is 76% in non-regular workers. This difference is balanced by relying hiring more in non-regular workers. On the other, churning adjustment is independent from total hour change both in regular workers and in non-regular workers.

56. Secondly, the difference between regular and non-regular workers is much less in negative regime, when establishments reduce the total hour worked. As the majority of overall separation behaviours consists of separation in negative regime, a gap between regular workers and non-regular workers in separation rather than in hiring. This may be partially because the constraint from labour supply condition of non-regular workers that a substantial portion of non-regular workers expect to work within a fixed working time (e.g. 10:00 to 16:00) due to their other activities such as child care. In this case, it is natural that they are reluctant to increase hours out of their working time, while it is not difficult to reduce hours if it is within the working time. The consistency of separation and inconsistency of hiring may remind us the shift of hiring function and the stability of separation function as discussed later. If the hiring function shifted up in non-regular workers, due to the de-regulation of legislation during the latter half of 1990s, the transition of hiring behaviour may be explained.

57. To sum up, all of distinctions based on firm size and industry are significatnt to understand the difference in hiring/separation behaviours. However, this does not always mean that the heterogeneity is relevant in an economic sense. To evaluate how much extent does the heterogenous technologies matter, we aggregate the total hiring and separation based on two estimations of homogenous and heterogenous technology. By comparing them with actual hiring and separation rates, we can see the usefulness of introducing heterogeniety to explain the actual behavior.

6.3 Analysis of adjustment behaviour across establishment over time

58. Confirmed the cross seactional heterogeneity of adjustment technology, we examine, in this section, the overtime fluctuations of technologies. In table 5 we depicts the estimated coefficients of the parametric specification as in (4.2), based on the homogenous technology but year by year.

Table 5**. Adjustment parameters with respect to total hours growth rate by year**

Regression coefficients with establishment fixed effect (quarterly MLS; -10% to +10% total hour change)

	Panel A. Hiring Rates			Panel B. Separation **Rates**			**Panel C. Average Hour Worked**		
	Positive regime (β^p)	Negative regime (β^n)	Constant	Positive regime (β^p)	Negative regime (β^n)	Constant	Positive regime (β^p)	Negative regime (β^n)	Constant
Year									
1991	0.129	0.094	0.037	-0.037	-0.091	0.037	0.845	0.799	-0.001
1992	0.167	0.037	0.037	-0.003	-0.147	0.036	0.834	0.821	-0.002
1993	0.146	0.067	0.039	-0.004	-0.108	0.040	0.847	0.810	-0.002
1994	0.104	0.082	0.037	-0.012	-0.081	0.037	0.880	0.839	0.000
1995	0.073	0.057	0.036	-0.020	-0.101	0.037	0.908	0.841	0.000
1996	0.100	0.097	0.040	-0.056	-0.099	0.042	0.860	0.787	-0.001
1997	0.128	0.047	0.039	-0.011	-0.100	0.040	0.868	0.844	0.001
1998	0.092	0.071	0.037	-0.015	-0.098	0.038	0.896	0.827	0.000
1999	0.114	0.097	0.038	-0.040	-0.088	0.041	0.839	0.808	0.001
2000	0.099	0.115	0.039	-0.046	-0.081	0.040	0.852	0.795	0.000
2001	0.061	0.044	0.041	-0.060	-0.074	0.042	0.884	0.877	0.001
2002	0.087	0.055	0.039	-0.032	-0.140	0.042	0.890	0.795	0.000
2003	0.131	0.030	0.037	0.001	-0.121	0.039	0.874	0.838	0.001
2004	0.159	0.123	0.043	-0.014	-0.083	0.043	0.817	0.778	-0.003
2005	0.090	0.080	0.042	-0.011	-0.089	0.040	0.896	0.829	-0.002
2006	0.097	0.072	0.043	-0.026	-0.087	0.042	0.876	0.834	-0.001
2007	0.003	0.128	0.048	-0.105	-0.032	0.047	0.904	0.835	-0.003
2008	0.134	0.093	0.041	-0.032	-0.104	0.040	0.837	0.787	-0.002
2009	0.095	0.057	0.041	-0.083	-0.033	0.046	0.823	0.911	0.003

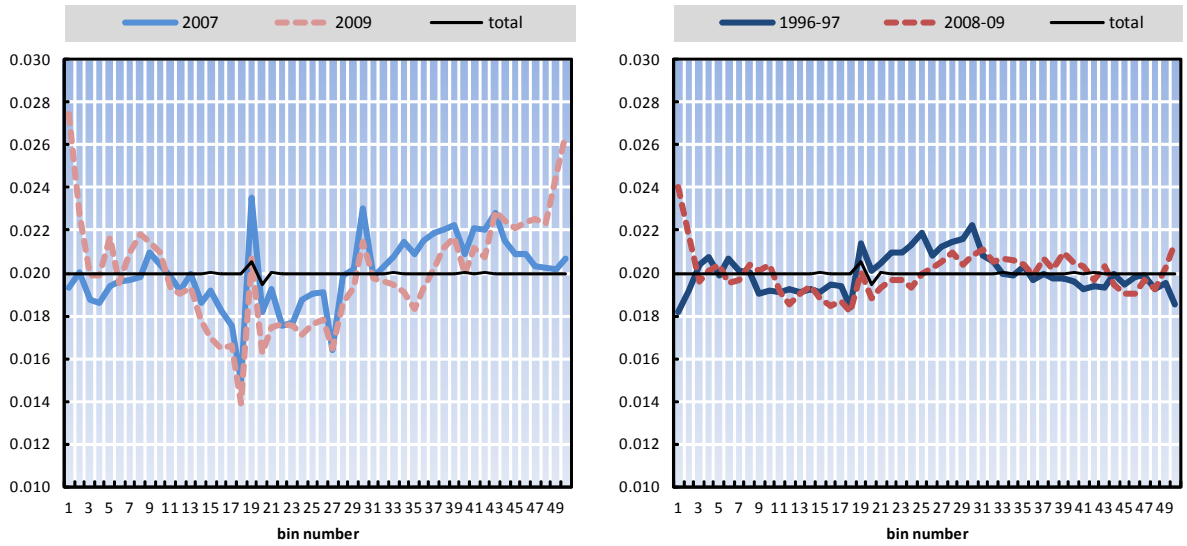
Source: Authors' estimation based on the *Monthly Labor Survey.*
Footnotes:Fullsets of estimated results can be found in Annex Table A4.

59. The relative importance of different adjustment margins in total hours changes shows considerable variation over time but it is not straightforward to relate this to the business cycle. It also seems to be difficult from table 5 to extract an implication as for the fluctuation of hiring/separation function directly. However, we introduce an indirect way to evaluate the fluctuation of functions. The point is that the actual hiring/separation behaviour is determined by the combination of coeffectients ($\beta_{jt}^{n,p}$) and distribution of total hour (Δl_{ijt}). As a matter of fact, we can confirm the shock distribution has moved from time to time. For example, when the economy gets into the recession, the distribution of total hour change naturally shifts left-ward. The Panel A of figure 9 draws the densities of each bin of two years; 2007 (the end of boom) and 2009 (the crisis era). Different from other figures, here we drop the share of each bin within the year. As the width of 50 bins is fixed by pooled data, the density by total sample is always 2% (except for near to bins which include zero change) [20]. Panel A clearly shows expanding variance of distribution during the current crisis. In deeping the recession, the share of large positive total change reduced and the share of small total hour change increased. Interestingly, the share of decreasing total hour

20. The spike of total in fig. 9 is around zero-change width.

did not increased so much. But this was not true during the Asian Crisis. Even comparing them between recessions, 1996-97 and 2008-09, it is shown that there is a substantial difference in distributions (Panel B). Actually, during 2008-09 recession, the ratio of expanding total labor input under recession inceased.

Figure 9. **The distribution of total hour change (quarterly MLS)**



Source: Authors' estimation based on the *Monthly Labor Survey.*

60. Given the distributional shift of total hour change, we evaluate the economic magnitude of impact of coefficient shifts in table 5. To do so, we conducted a simple simulation. We pin down the hiring/separation coefficients on those estimated from the data of certain period, and apply them to all of actual shock distributions in other periods. As the benchmark, we fix the coefficients during the Asian crisis (between 1997 Q3 and 1998 Q4) by estimating the heterogenous hiring/separation functions as follows:

$$(4.2)''' \qquad x_{ijt} = \alpha_i + \beta_j^{n,A}\Delta l_{ijt} I(\Delta l_{ijt} < 0) + \beta_j^{p,A}\Delta l_{ijt} I(\Delta l_{ijt} > 0) + \varepsilon_{ijt}$$

(j=1,…,90, t=1997Q3,…, 1998 Q4)

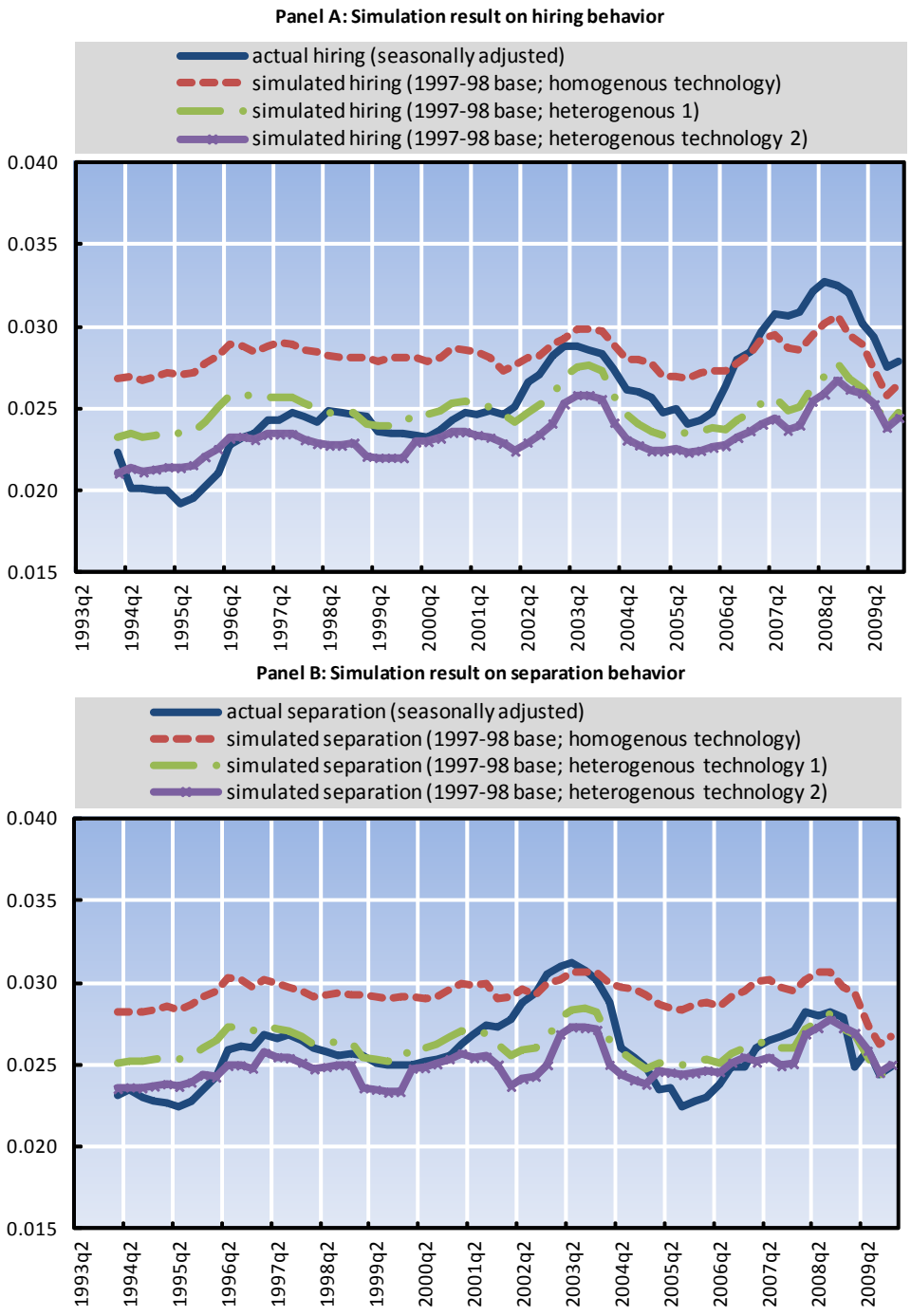
Then, we apply the estimated coefficients to all of remaining sample, and sum up the predicted flows.

$$(5)'' \qquad \hat{x}_t^A = \sum_j w_{jt} \sum_i w_{it}^2 \left(\hat{\beta}_j^{n,A}\Delta l_{ijt} I(\Delta l_{ijt} < 0) + \hat{\beta}_j^{p,A}\Delta l_{ijt} I(\Delta l_{it} > 0) \right) \qquad (t=1992Q1,\ldots, 2009Q4)$$

For comparioson, figure 16 also dipicts the aggregated actual hiring/separation rates, the simulated flows based on homogenous technology (corresponding to table 5) as well as those based on heterogenous

technology only considering of industry and firm size. To present the implication of figure simply, we impute the major rotation timing as the average of previous and next year, and take 4 quarter moving average.

Figure 10. **Simulation results (quarterly MLS; -10% to +10% change)**



Source: Authors' estimation based on the *Monthly Labor Survey.*
Heterogenous technology 1: 9 industry by 5 firm size
Heterogenous technology 2: 9 industry by 5 firm size by 2 title

61. Figure 10 shows significant deviations from actual series to simulated series especially in hiring. This means that the fluctuation of actual hiring rates cannot be explained by the shifts of distribution of total hour change, implying substantial changes in hiring functions in (4.2)''' from time to time. In figure 10, it is unclear if there are substantial changes in contributions of hiring/separation or adjustment hours to total hour change, but we can confirm their shifts from the simulation results.

62. More interestingly, the simulation implies the role of shifts in functions may be different from the fluctuation of separation behaviour to that of hiring behaviour, because the distributional shifts of total hour change seem to capture the actual separation rates much more than it does the hiring rates. It is apparent, from the figure, that the heterogenous technologies estimates the actual separations much more exactly than hirings. Actually, the average absolute deviation to actual hiring rates is 0.0032 from homogenous technology, 0.0023 from heterogenous technologies of industry and firm size, and 0.0026 from heterogenous technologies additionally including regular and non-regular distinction, whereas the average deviations in separations are 0.0033, 0.0012, and 0.0012 respectively. The 1997-98 homogenous technology estimated the hiring almost as much as it does the separation. However, when we take the heterogeneity among sectors in 1997-98 into account, the estimated separation track the actural behaviror much more exactly than it does the hiring. This is the reflection of changes in hiring function from 1997-98 to corresponding period.

7. Source of change in hiring behavior

63. The next question naturally arises where the coefficients change come from? As shown in the introduction section of the article, one of the most important features in the Japanese labor market during 1990s was the increase in non-regular workers, and we have already shown the institutional change may be responsible to it. Therefore we examine, in this section, whether the change in hiring behaviour is related to the distinction of adjustment behaviours between regualar and non-regular workers.

64. To this end, the model is estimated separately for h^{reg}, s^{reg} or Δq^{reg} and h^{non}, s^{non} or Δq^{non} where superscripts *noni* and *reg* refer to non-regular and regular workers respectively and for every year since 1994.[21] This means that the sample starts before the labour market reforms were implemented. Taking the difference between each year and the base year, t=1994, and comparing between regular and non-regular

[21] This limitation is due to the data.

workers allows one estimate the following difference-in-differences effect for each year, *t+s*, growth interval and cell.

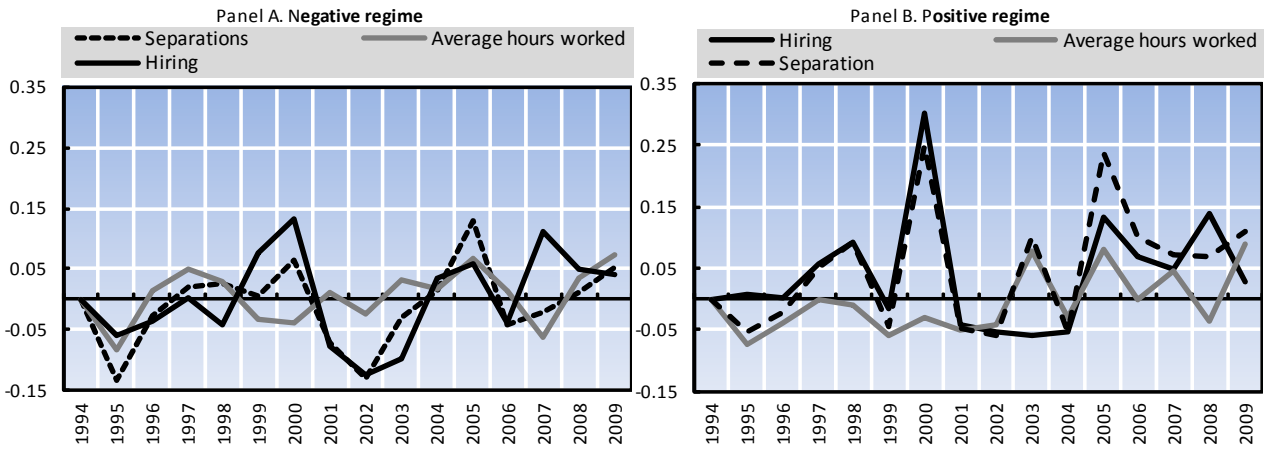
(6) $$\delta_{x,s} = \left(\hat{\beta}^{non}_{1994+s} - \hat{\beta}^{reg}_{1994+s}\right) - \left(\hat{\beta}^{non}_{1994} - \hat{\beta}^{reg}_{1994}\right)$$

65. The difference-in-differences estimate controls for any changes in the adjustment functions of regular and non-regular workers that are common across both groups such as differences in macro-economic conditions. Since the rise in non-regular work may affect the adjustment functions of both regular and non-regular workers the difference-in-difference effect should be interpreted with caution. It captures the *differential* effect of the rise in non-regular work on the adjustment behaviour of firms with respect non-regular workers *relative* to regular workers and not the effect of the rise in non-regular work on the adjustment behaviour of firms with respect to non-regular workers as would be the standard interpretation of a difference-in-differences estimator.

66. In order to analyse the implications of the rise in non-regular work for labour input adjustment, this section systematically differentiates between regular and non-regular workers.[22] More specifically, the aim of this section is to analyse the relative burden on adjustment on regular and non-regular workers and how this has involved over time as restrictions on the use of non-regular contracts have been relaxed and the incidence of non-regular work has increased. Figure 11 presents the difference-in-difference results: the difference in the adjustment parameter between regular and non-regular workers in year *t+s* relative to the base year t=1994 before the acceleration in the rise of the incidence of non-regular work.

Figure 11**. The impact of the rise in non-regular work for total hour adjustment**

(quarterly MLS; -10% to 10% change)



22. As information on this distinction is only available from 1994 onwards we lose the first three years of our sample.

Source: Authors' estimation based on the *Monthly Labor Survey.*

67. The difference-in-difference results in figure 11 show that a stable relation between regular and non-regular adjustment behaviour in negative regime (the actual hiring/separation coefficients are in Annex). On the other, in positive regime, the difference of adjustment behaviour between regular and non-regular workers seens to be expanding, especially during boom periods.[23] When we go back to the actual hiring/separation coefficients in positive regime, compared with the difference in 1994, the hiring coefficient is likely to increase in non-regular workers and looks to be stable in regular workers. Behind the upward shift of hiring, separation behaviours in non-regular workers also get active. As many of hiring are cancelled out, resulting net employment does not always grows through hiring and separation. This is why the adjustment of non-regular workers are getting reling on hour adjustment after 2000s.

68. Although the relative increased hiring coefficients in positive regime in non-regular workers is consistent with the institutional change surrounding non-regular workers as is previously shown in this article,[24] it may be puzzling when we do not see a systematic shift in separation coefficients in negative regime, because the change in adjustment costs should affect both of the hiring and separation behaviour when the agents are sufficiently rational. However, we have to be cautious that the institutional reform of non-regular workers during late 1990s are mainly related only to hiring behaviour of them, leaving the regal assignment on their separation as before. In this case, the effect of reform on separation in negative regime can be secondary. More interestingly in figure 11 the separation coefficients in positive regime (churing) increased relatively in non-regular workers, meaning accelarated separations of non-regular workers from estalblishment which increased total hour. It is possible to interpret the figure that as a result of relative increase in both of hiring and separation of non-regular workers, the average hour adjustment of them could not be altered. This interpretation is also consistent with the remained reliance on average hour change in the recent crisis introduced in the beginning of this article.

8. Concluding remarks

69. As in many countries, the Japanese labor market has experienced de-regulatory changes since the end of 1980s. Remarkable is the relaxation of non-regular workers enacted during the latter half of

23. $\delta_{x,s} > 0 \leftrightarrow \left(\hat{\beta}^{non}_{1994+s} - \hat{\beta}^{reg}_{1994+s}\right) > \left(\hat{\beta}^{non}_{1994} - \hat{\beta}^{reg}_{1994}\right)$. Since $\hat{\beta}^{non}_{1994+s} > \hat{\beta}^{reg}_{1994+s} > 0$ in hiring of positive regime, positive delta means increased coefficients in non-regular hiring and/or decreased coefficients in regular hiring.

24. Other interpretation is that the hiring coefficients have increased due to the wide spread of intermediate business of labor markets.

1990s. The upper bound of fixed term in labor contracts has been extended from one year to three, and temporary work agency has been able to dispatch workers to almost every field of economy. Despite the the rising incidence of non-regular work and of changing structures in labor markets, macro-economic data do not suggest that the adjustment behaviour of Japanese firms during the global crisis is very different from those observed furing previous downturns: Japanese firms continued to hoard on a massive scale and large adjusted by reducing working time, while job loss were limited. In order to explain this somewhat surprising stylised fact, detailed micro-economic data that allow one to study how the behaviour of similar firms has evolved during the last two decades, while controlling for differences in product market conditions.

70. This research examines the implications of the rise in non-regular work for labour market resilience using two types of large nationally representative dataset of establishments for the period 1991-2009, focucing on the Current Crisis. One is yearly cros-sectional survey, Employment Trend Survey, that includes detailed information on hired and separated workers. The other is Monthly Labor Survey that has a panel structure and 33,000 establishments report labor flows, total hour worked, and wage bills every month. While the former is a conventional dataset to examine job flows in Japan, this research is the first attemp to expoit the latter data, especially high frequent information on total hour worked, in micro level analysis.

71. Taking the net employment change and total hour change of each establishment as the proxy of output shock they received, we examined the labour-input adjustment responses of employers to verify the role of the increased non-regular work for the adjustment behaviour. This is in the same line as the literature of Job Creation and Destruction, lead by Steve Davis and John Haltiwanger since 1990s. Based on the previous literature, we first examined a general view of labor input adjustment, by using non-parametric as well as parametric approach. An advantage of our research is to extend the dimension of decision making by employers from hiring/separation to labor hour. The hour worked is a good proxy actually inputted into the production process, and economists have realized the trade-off between the adjustment in employment and that in average hour for many years. Partially due to the data constraint, however, the previous literature on job creation and destruction does not always include such a traditional aspect on hour adjustment. This research sheds some light on the role of adjustment by intensive margin to analyse the effect of labor market reform and its role on the Current Crisis.

72. The empirical anlaysis clearly shows a ‘churning’ and ‘kink’ behaviours of adjustments. The establishment, which does not change total labor input at all, keeps to hire and separate about 3% of employment in each quarter (approximately over 10% per year). Moreover, another employment change

analysis suggested that almost half of the churning behaviour is due to layoffs which are initiated by employer. These evidences indicate the reallocation process of working opportunity continues to be active even behind an unchanged establishment. We also confirmed the asymetric hiring/separation responses between positive and negative adjustments even in case of considering of total hour change. This observation implies that there exists a fixed cost for employment and, more importantly, that the shape of distribution of labor demand shocks is crutial to assess the aggregated hiring and separation behaviour.

73. In fact, we found a substantial difference in total hour change distribution between during the Current Crisis and during the Asian Crisis. Compared with the distribution in total hour change during the Asian Crisis, the share of establishments which increased total labor input has not been deteriorated during the Current Crisis. Taking the huge decline of total labor hour in macro statistics into account, the decease in labor hour may be concentrated in certain sectors such as large size assembly manufacturers during the Current Crisis. Apparently the distributional shift was one source of the variation in labor flows in recent Japan. To confirm the role of distributional shift to explain the actual fluctuations in hiring and separation, we conducted some simulations, resulting that, while in separation rates the distiributional shift of total hour change explains well the actual fluctuation, the aggregated hiring behaviour cannot be replicated solely by the shift in distribution but it is necessary to additionally consider of the technological change in hiring workers.

74. The research picks up the insititutional change in hiring non-regular workers which had been conducted during the late 1990s, and found the hiring response to total hour change has relatively increased in non-regular workers since the latter half of 2000s. The de-regulation of non-regular workers has surely encouraged to hire the non-regular workers through reducing the restriction of using fixed-term contracts. The disaggregated analysis in this article can properly illustrate the effect of institutional change, considering of employers' heterogeneity in both terms of adjustment technologies and shocks they received.

75. The research leaves several discussions open. For example, it should be noted that the separation behaviour of non-regular workers in *expanding* establishment has also been acceralated. As the main body of such churning-separation is expected to be inisiated by employee themselves, a more careful analysis, including wage adjustment aspects and labor supply conditions, will contribute to reveal the effect of labor market reform of non-regular workers. Moreover, the stable separation behaviour in negative regime was not what we expected, as the non-regularity of workers is notorious for its instablility of employment. One important consideration may be from the development of human resource management of non-regular workers, such as long-term employment. It is often pointed out that some employers have already started to extend the long-term employment system even to non-regular workers since 1990s. Actually the average

tenure of female non-regular workers continued to increase through the Current Crisis, which is consistent with our findings. When the managers find more values to keep the non-regular workers than before, it is natural there is no effect on separation behaviour by shrinking employers. These researches should be pursued by cultivating new datasets which include detailed aspects of human resource management of non-regular workers.

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ANNEX

Measurement bias in the deviation between simulated and actual flow.

76. It is not easy to isolate the measurement errors from the deviation between simulated and actual figures. To argue this issue, we calculated the total average of labour flows based on both actual and simulated data. The aggregation by heterogenous technologies use the prediction from the flow function of each group *j* as in (4.2)'. Here we define 90 goups as 5 firm size categories by 9 one-digit industry by regular and non-regular workers.

(4.2)' $$x_{ijt} = \alpha_i + \beta_j^n \Delta l_{ijt} I(\Delta l_{ijt} < 0) + \beta_j^p \Delta l_{ijt} I(\Delta l_{ijt} > 0) + \varepsilon_{ijt} \quad (j=1,\ldots,90)$$

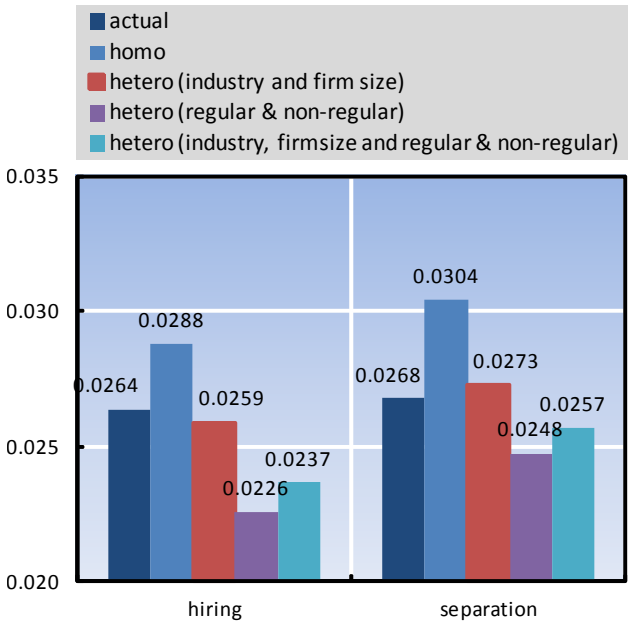
Then, we sum up the predicted flows of each individual as

(5) $$\hat{x}^{hetero} = \sum_t \sum_j w_{jt} \sum_i (w_{it}^2 \cdot \omega_{it}) \left(\widehat{\beta_j^n} \Delta l_{ijt} I(\Delta l_{ijt} < 0) + \widehat{\beta_j^p} \Delta l_{ijt} I(\Delta l_{it} > 0) \right)$$

w_{it}^2 is the employment share among group *j* at *t* of sample *i*, ω_{it} is the inverse sampling probability, and w_{jt} is the employment share among total employment at *t* of each guroup *j*. The results are depicted in the next figure A.

Figure A. **Aggregated flows homogenous technology and heterogenous technologies**

(quarterly MLS; -10% to +10% total hour change)

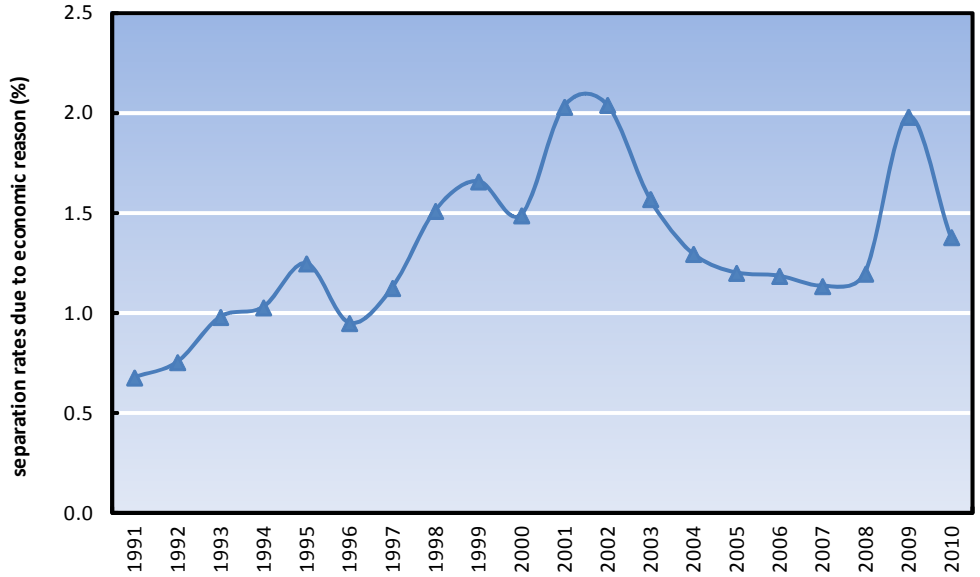


Source: Authors' estimation based on the *Monthly Labor Survey.*

77. Both of actual average hiring rate and separation rate was around 2.6% between 1992 Q1 and 2009 Q4. The aggregation based on homogenous technology estimates 2.9% and 3.0% respectively. On the other hand, heterogenous technologies, dishtingushing 90 groups within economy, produce 2.4% and 2.6%.

78. If the aggregated fixed effect and error term is zero i.e. $\sum_{\mathrm{j}} w_{jt} \sum_{\mathrm{i}} w_{it}^{2} \omega_{\mathrm{it}}(\alpha_{\mathrm{i}} + \varepsilon_{\mathrm{it}}) = 0$, above five averages should be the same. Because $\sum_{\mathrm{i}} \omega_{\mathrm{it}} \alpha_{\mathrm{i}} = 0$ and $\sum_{\mathrm{i}} \omega_{\mathrm{it}} \varepsilon_{\mathrm{it}} = 0$ by the definition of estimation method, the deviation between actual hiring/separation and simulated series in figure A implies the employment share of establishment *i* may correlate with error term.

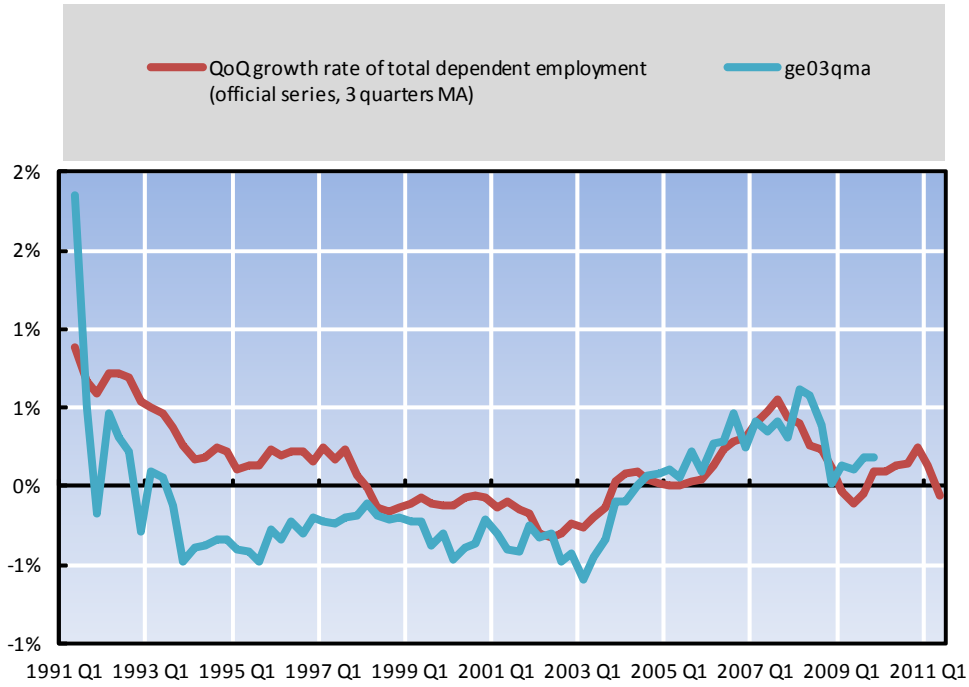
Figure B. **Transition of the separation rates due to economic reason in Japan, 1991-2010**



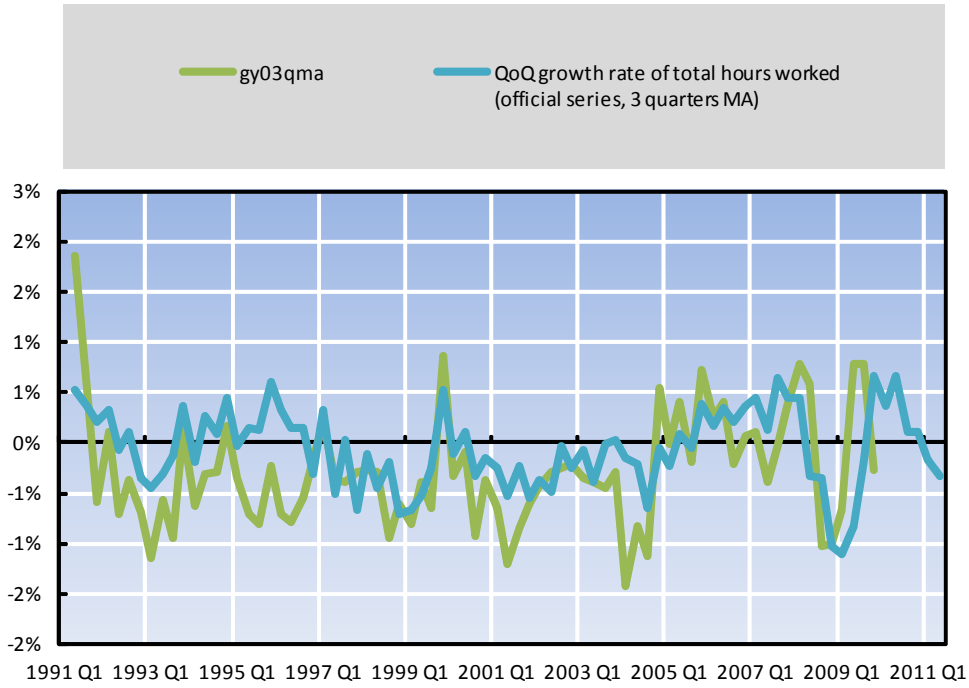
Source: ETS long-term tabulation

Figure C. **Evolution of the percentage change in employment and total hours worked**

Panel A. **Dependent employment**



Panel B. **Hours worked (Dependent employment)**



Source: Ministry of Labour, *Monthly Labour Survey.*

Table A1. Full sets of aggregate parametric results (employment change)

Panel A. Decomposition of **hiring/separation behavior**

	Positive regime (β^p)	Negative regime (β^n)	**Constant**	**# of obs.**	**R^2**
Full sample					
Hiring rates	1.2592	-0.0366	0.1121	165,903	0.1897
	(0.0181)	*(0.009)*	*(0.0007)*		
Separation rate	0.2592	-1.0366	0.1121	165,903	0.3619
	(0.0181)	*(0.009)*	*(0.0007)*		
Resticted sample (-10% to 10% change)					
Hiring rates	1.4543	0.2058	0.1124	125,748	0.0902
	(0.028)	*(0.0284)*	*(0.001)*		
Separation rate	0.4543	-0.7942	0.1124	125,748	0.0249
	(0.028)	*(0.0284)*	*(0.001)*		

Panel B. **Decompostion of separation behavior**

	Positive regime (β^p)	Negative regime (β^n)	**Constant**	**# of obs.**	**R^2**
Full sample					
Quit rates	0.0939	-0.2063	0.0598	165,590	0.0473
	(0.01)	*(0.014)*	*(0.0007)*		
Layoff rate	0.0372	-0.2511	0.0185	165,590	0.1213
	(0.0058)	*(0.015)*	*(0.0006)*		
Transfer rate	0.1252	-0.5796	0.0336	165,590	0.3097
	(0.012)	*(0.0198)*	*(0.0009)*		
Resticted sample (-10% to 10% change)					
Quit rates	0.3061	-0.3068	0.0526	125,509	0.0109
	(0.021)	*(0.019)*	*(0.0006)*		
Layoff rate	0.0395	-0.2060	0.0190	125,509	0.0109
	(0.011)	*(0.013)*	*(0.0004)*		
Transfer rate	0.1087	-0.2819	0.0408	125,509	0.0079
	(0.018)	*(0.019)*	*(0.0006)*		

Table A2. Full sets of aggregate parametric results (<u>total hour change</u>)

	Positive regime	Negative regime	Constant	# of obs.	R^2
Full sample					
Hiring rates	0.3910	-0.0114	0.0335	1,526,051	0.1439
	(0.001)	*(0.001)*	*(0.0001)*		
Separation rate	0.0619	-0.4290	0.0314	1,526,051	0.1646
	(0.001)	*(0.001)*	*(0.0001)*		
Average hours worked	0.6798	0.5900	-0.0029	1,526,051	0.5419
	(0.001)	*(0.001)*	*(0.0001)*		
Resticted sample (-10% to 10% change)					
Hiring rates	0.1253	0.0779	0.0393	1,000,279	0.0071
	(0.003)	*(0.003)*	*(0.0001)*		
Separation rate	-0.0299	-0.1078	0.0400	1,000,279	0.0036
	(0.003)	*(0.003)*	*(0.0001)*		
Average hours worked	0.8458	0.8095	-0.0002	1,000,279	0.3683
	(0.003)	*(0.003)*	*(0.0001)*		

Table A3. Full sets of aggregate parametric results by firm size, industry and employment status (total hour change)

Panel A. **Hiring Rates**

	Positive regime (β^p)	Negative regime (β^n)	**Constant**	**# of obs.**	**R^2**
Firm size class					
5-29	0.1167	0.0895	0.0367	399,650	0.0054
	(0.0061)	*(0.006)*	*(0.0003)*		
30-99	0.1327	0.0674	0.0415	115,028	0.0073
	(0.009)	*(0.009)*	*(0.0004)*		
100-499	0.1240	0.0639	0.0403	106,510	0.0072
	(0.009)	*(0.0087)*	*(0.0004)*		
500-999	0.1172	0.0781	0.0392	112,769	0.0093
	(0.0077)	*(0.008)*	*(0.0003)*		
over 1000	0.1416	0.0660	0.0415	205,728	0.0093
	(0.006)	*(0.0059)*	*(0.0003)*		
Industry					
Manufacturing	0.0821	0.0434	0.0267	326,320	0.0048
	(0.004)	*(0.004)*	*(0.0002)*		
Other service	0.1628	0.0970	0.0462	294,312	0.0091
	(0.007)	*(0.006)*	*(0.0003)*		
Retail, Wholesale & Restaurants	0.1282	0.0974	0.0521	185,419	0.0060
	(0.009)	*(0.009)*	*(0.0004)*		
Construction	0.1357	0.0930	0.0334	60,654	0.0101
	(0.013)	*(0.013)*	*(0.0006)*		
Employment Status					
Regular	0.0933	0.0632	0.0281	860,990	0.0040
	(0.004)	*(0.003)*	*(0.0002)*		
Non-regular	0.1831	0.0689	0.0537	366,601	0.0011
	(0.018)	*(0.017)*	*(0.0008)*		

Panel B. Separation **Rates**

	Positive regime (β^p)	Negative regime (β^n)	**Constant**	**# of obs.**	**R^2**
Firm size class					
5-29	-0.0466	-0.1301	0.0375	399,650	0.0043
	(0.006)	*(0.006)*	*(0.0003)*		
30-99	-0.0542	-0.1234	0.0431	115,028	0.0060
	(0.009)	*(0.009)*	*(0.0004)*		
100-499	-0.0331	-0.1165	0.0413	106,510	0.0051
	(0.009)	*(0.0086)*	*(0.0004)*		
500-999	-0.0122	-0.0817	0.0391	112,769	0.0026
	(0.0077)	*(0.007)*	*(0.0003)*		
over 1000	0.0014	-0.0828	0.0423	205,728	0.0020
	(0.006)	*(0.0058)*	*(0.0003)*		
Industry					
Manufacturing	-0.0464	-0.1016	0.0294	326,320	0.0072
	(0.004)	*(0.004)*	*(0.0002)*		
Other service	0.0150	-0.0936	0.0438	294,312	0.0013
	(0.007)	*(0.006)*	*(0.0003)*		
Retail, Wholesale & Restaurants	-0.0617	-0.1274	0.0538	185,419	0.0045
	(0.009)	*(0.009)*	*(0.0004)*		
Construction	-0.0333	-0.1243	0.0347	60,654	0.0049
	(0.013)	*(0.013)*	*(0.0006)*		
Employment Status					
Regular	-0.0284	-0.0892	0.0300	860,990	0.0023
	(0.004)	*(0.004)*	*(0.0002)*		
Non-regular	-0.0288	-0.1102	0.0563	366,601	0.0004
	(0.018)	*(0.018)*	*(0.0008)*		

Panel C. Average Hours Worked

	Positive regime (β^p)	Negative regime (β^n)	**Constant**	**# of obs.**	**R^2**
Firm size class					
5-29	0.8377	0.7747	-0.0005	399,650	0.2837
	(0.0056)	*(0.006)*	*(0.0002)*		
30-99	0.8154	0.8056	0.0008	115,028	0.3586
	(0.0083)	*(0.008)*	*(0.0004)*		
100-499	0.8468	0.8145	0.0001	106,510	0.4326
	(0.008)	*(0.0074)*	*(0.0003)*		
500-999	0.8703	0.8374	-0.0007	112,769	0.4774
	(0.0068)	*(0.007)*	*(0.0003)*		
over 1000	0.8612	0.8458	0.0000	205,728	0.4707
	(0.005)	*(0.0049)*	*(0.0002)*		
Industry					
Manufacturing	0.8750	0.8501	0.0019	326,320	0.4816
	(0.004)	*(0.004)*	*(0.0002)*		
Other service	0.8497	0.8062	-0.0032	294,312	0.3422
	(0.006)	*(0.005)*	*(0.0002)*		
Retail, Wholesale & Restaurants	0.8139	0.7672	0.0004	185,419	0.2562
	(0.008)	*(0.008)*	*(0.0004)*		
Construction	0.8274	0.7740	0.0001	60,654	0.3277
	(0.013)	*(0.013)*	*(0.0006)*		
Employment Status					
Regular	0.8769	0.8351	0.0004	860,990	0.3188
	(0.004)	*(0.003)*	*(0.0002)*		
Non-regular	0.7617	0.7977	0.0022	366,601	0.0468
	(0.016)	*(0.016)*	*(0.0007)*		

Table A4. Full sets of aggregate parametric results by year (total hour change)

Panel A. **Hiring Rates**

	Positive regime (β^p)	Negative regime (β^n)	Constant	# of obs.	R^2
Year					
1991	0.1289	0.0943	0.0372	45,740	0.0104
	(0.017)	*(0.017)*	*(0.0007)*		
1992	0.1666	0.0372	0.0373	59,103	0.0095
	(0.0138)	*(0.013)*	*(0.0006)*		
1993	0.1460	0.0671	0.0392	50,740	0.0083
	(0.017)	*(0.0173)*	*(0.0007)*		
1994	0.1039	0.0825	0.0371	57,617	0.0072
	(0.0143)	*(0.014)*	*(0.0006)*		
1995	0.0734	0.0568	0.0361	57,873	0.0037
	(0.014)	*(0.0135)*	*(0.0006)*		
1996	0.1003	0.0966	0.0404	51,597	0.0063
	(0.017)	*(0.018)*	*(0.0007)*		
1997	0.1284	0.0474	0.0386	55,569	0.0060
	(0.015)	*(0.015)*	*(0.0006)*		
1998	0.0924	0.0714	0.0373	58,112	0.0057
	(0.014)	*(0.013)*	*(0.0006)*		
1999	0.1136	0.0968	0.0379	49,596	0.0066
	(0.019)	*(0.019)*	*(0.0008)*		
2000	0.0986	0.1145	0.0394	56,198	0.0081
	(0.015)	*(0.015)*	*(0.0006)*		
2001	0.0607	0.0444	0.0406	53,796	0.0020
	(0.0165)	*(0.015)*	*(0.0007)*		
2002	0.0868	0.0555	0.0394	48,841	0.0038
	(0.0167)	*(0.017)*	*(0.0007)*		
2003	0.1314	0.0302	0.0374	53,945	0.0053
	(0.015)	*(0.0152)*	*(0.0007)*		
2004	0.1589	0.1229	0.0431	47,997	0.0116
	(0.0192)	*(0.018)*	*(0.0008)*		
2005	0.0901	0.0797	0.0417	51,123	0.0049
	(0.017)	*(0.0164)*	*(0.0007)*		
2006	0.0968	0.0725	0.0426	52,762	0.0051
	(0.016)	*(0.016)*	*(0.0007)*		
2007	0.0029	0.1279	0.0476	48,337	0.0037
	(0.018)	*(0.018)*	*(0.0008)*		
2008	0.1338	0.0929	0.0413	56,358	0.0093
	(0.015)	*(0.015)*	*(0.0006)*		
2009	0.0950	0.0569	0.0409	44,975	0.0040
	(0.019)	*(0.019)*	*(0.0008)*		

Panel B. Separation **Rates**

	Positive regime (β^p)	Negative regime (β^n)	**Constant**	**# of obs.**	**R^2**
Year					
1991	-0.0369	-0.0911	0.0366	45,740	0.0039
	(0.0162)	*(0.017)*	*(0.0007)*		
1992	-0.0031	-0.1473	0.0358	59,103	0.0066
	(0.0133)	*(0.013)*	*(0.0006)*		
1993	-0.0037	-0.1084	0.0398	50,740	0.0028
	(0.017)	*(0.0169)*	*(0.0007)*		
1994	-0.0123	-0.0812	0.0373	57,617	0.0022
	(0.014)	*(0.014)*	*(0.0006)*		
1995	-0.0204	-0.1007	0.0366	57,873	0.0038
	(0.014)	*(0.0133)*	*(0.0006)*		
1996	-0.0565	-0.0992	0.0419	51,597	0.0041
	(0.017)	*(0.017)*	*(0.0007)*		
1997	-0.0113	-0.0996	0.0402	55,569	0.0028
	(0.015)	*(0.015)*	*(0.0006)*		
1998	-0.0153	-0.0982	0.0378	58,112	0.0033
	(0.014)	*(0.013)*	*(0.0006)*		
1999	-0.0401	-0.0879	0.0409	49,596	0.0025
	(0.019)	*(0.019)*	*(0.0008)*		
2000	-0.0456	-0.0808	0.0401	56,198	0.0030
	(0.015)	*(0.015)*	*(0.0006)*		
2001	-0.0602	-0.0738	0.0425	53,796	0.0034
	(0.0162)	*(0.015)*	*(0.0007)*		
2002	-0.0322	-0.1396	0.0422	48,841	0.0055
	(0.017)	*(0.018)*	*(0.0007)*		
2003	0.0014	-0.1210	0.0394	53,945	0.0034
	(0.015)	*(0.0151)*	*(0.0007)*		
2004	-0.0138	-0.0833	0.0427	47,997	0.0017
	(0.0188)	*(0.018)*	*(0.0008)*		
2005	-0.0110	-0.0885	0.0400	51,123	0.0021
	(0.016)	*(0.016)*	*(0.0007)*		
2006	-0.0255	-0.0875	0.0416	52,762	0.0026
	(0.016)	*(0.016)*	*(0.0007)*		
2007	-0.1051	-0.0317	0.0472	48,337	0.0037
	(0.017)	*(0.017)*	*(0.0008)*		
2008	-0.0316	-0.1039	0.0405	56,358	0.0035
	(0.015)	*(0.015)*	*(0.0006)*		
2009	-0.0831	-0.0333	0.0460	44,975	0.0024
	(0.019)	*(0.019)*	*(0.0008)*		

Panel C. Average Hour Worked

	Positive regime (β^p)	Negative regime (β^n)	Constant	# of obs.	R^2
Year					
1991	0.8454	0.7993	-0.0006	45,740	0.3992
	(0.0157)	*(0.016)*	*(0.0007)*		
1992	0.8344	0.8213	-0.0016	59,103	0.4000
	(0.013)	*(0.013)*	*(0.0006)*		
1993	0.8470	0.8096	-0.0016	50,740	0.3743
	(0.015)	*(0.0156)*	*(0.0007)*		
1994	0.8796	0.8392	0.0003	57,617	0.4334
	(0.0128)	*(0.012)*	*(0.0006)*		
1995	0.9076	0.8409	0.0004	57,873	0.4461
	(0.013)	*(0.0124)*	*(0.0006)*		
1996	0.8599	0.7875	-0.0014	51,597	0.3794
	(0.015)	*(0.015)*	*(0.0006)*		
1997	0.8679	0.8442	0.0011	55,569	0.4044
	(0.014)	*(0.013)*	*(0.0006)*		
1998	0.8963	0.8273	0.0001	58,112	0.4353
	(0.013)	*(0.012)*	*(0.0005)*		
1999	0.8388	0.8076	0.0009	49,596	0.3645
	(0.016)	*(0.016)*	*(0.0007)*		
2000	0.8520	0.7951	0.0004	56,198	0.3941
	(0.013)	*(0.013)*	*(0.0006)*		
2001	0.8839	0.8773	0.0015	53,796	0.4121
	(0.0149)	*(0.014)*	*(0.0006)*		
2002	0.8902	0.7951	0.0002	48,841	0.3728
	(0.0156)	*(0.016)*	*(0.0007)*		
2003	0.8740	0.8380	0.0014	53,945	0.3835
	(0.014)	*(0.0142)*	*(0.0006)*		
2004	0.8165	0.7782	-0.0025	47,997	0.3209
	(0.0171)	*(0.016)*	*(0.0007)*		
2005	0.8955	0.8293	-0.0017	51,123	0.3828
	(0.015)	*(0.0149)*	*(0.0007)*		
2006	0.8757	0.8337	-0.0013	52,762	0.3793
	(0.015)	*(0.015)*	*(0.0007)*		
2007	0.9039	0.8346	-0.0029	48,337	0.3770
	(0.017)	*(0.017)*	*(0.0007)*		
2008	0.8373	0.7870	-0.0015	56,358	0.3605
	(0.014)	*(0.014)*	*(0.0006)*		
2009	0.8234	0.9111	0.0029	44,975	0.3636
	(0.018)	*(0.018)*	*(0.0008)*		

Table A5. Full sets of aggregate parametric results by year and employment status (total hour change)

Year	A. Hirings, full-time workers					B. Hirings, part-time workers				
	Change in total hour		Constant	# of obs.	R^2	Change in total hour		Constant	# of obs.	R^2
	Positive regime	Negative regime				Positive regime	Negative regime			
1994	0.0697	0.0802	0.0297	56,227	0.0054	0.1006	0.0865	0.0545	20,904	0.0019
	(0.0135)	*(0.0131)*	*(0.0006)*			*(0.0502)*	*(0.0491)*	*(0.0022)*		
1995	0.0610	0.0373	0.0271	56,529	0.0026	0.1003	0.1025	0.0543	20,719	0.0023
	(0.0128)	*(0.0124)*	*(0.0006)*			*(0.0487)*	*(0.0492)*	*(0.0021)*		
1996*	0.0822	0.0806	0.0270	50,508	0.0050	0.1142	0.1217	0.0597	18,823	0.0017
	(0.0162)	*(0.0165)*	*(0.0007)*			*(0.0723)*	*(0.0751)*	*(0.003)*		
1997	0.0917	0.0373	0.0282	54,106	0.0037	0.1817	0.0399	0.0591	21,244	0.0020
	(0.0144)	*(0.0139)*	*(0.0006)*			*(0.0604)*	*(0.0589)*	*(0.0025)*		
1998	0.0986	0.0296	0.0265	56,707	0.0040	0.2214	0.0760	0.0518	22,106	0.0041
	(0.0136)	*(0.013)*	*(0.0006)*			*(0.0537)*	*(0.0523)*	*(0.0023)*		
1999*	0.0963	0.0787	0.0247	48,330	0.0049	0.1116	0.0099	0.0510	19,360	0.0008
	(0.0185)	*(0.0182)*	*(0.0008)*			*(0.058)*	*(0.0598)*	*(0.0025)*		
2000	0.0723	0.0781	0.0284	54,726	0.0043	0.4068	-0.0481	0.0518	22,925	0.0003
	(0.0153)	*(0.0148)*	*(0.0006)*			*(0.2901)*	*(0.2967)*	*(0.0126)*		
2001	0.0696	0.0389	0.0289	52,169	0.0025	0.0577	0.1215	0.0607	22,381	0.0021
	(0.0155)	*(0.0142)*	*(0.0007)*			*(0.0459)*	*(0.0441)*	*(0.002)*		
2002*	0.0376	0.0668	0.0254	47,385	0.0020	0.0141	0.1956	0.0627	20,162	0.0024
	(0.0168)	*(0.0175)*	*(0.0007)*			*(0.0538)*	*(0.058)*	*(0.0023)*		
2003	0.1081	0.0266	0.0266	52,077	0.0035	0.0798	0.1310	0.0579	23,215	0.0031
	(0.016)	*(0.0157)*	*(0.0007)*			*(0.0415)*	*(0.0417)*	*(0.0018)*		
2004*	0.1081	0.1012	0.0279	45,855	0.0053	0.0866	0.0713	0.0576	21,243	0.0009
	(0.022)	*(0.0208)*	*(0.0009)*			*(0.0606)*	*(0.0621)*	*(0.0026)*		
2005	0.0701	0.0924	0.0316	49,084	0.0034	0.2330	0.0388	0.0545	22,943	0.0012
	(0.0197)	*(0.0192)*	*(0.0008)*			*(0.0928)*	*(0.0926)*	*(0.004)*		
2006	0.0836	0.0564	0.0311	50,520	0.0033	0.1838	0.1024	0.0553	24,047	0.0051
	(0.0173)	*(0.0169)*	*(0.0007)*			*(0.0437)*	*(0.0428)*	*(0.0019)*		
2007*	0.0003	0.1083	0.0343	45,936	0.0020	0.0796	0.0040	0.0533	22,385	0.0004
	(0.0209)	*(0.0208)*	*(0.0009)*			*(0.053)*	*(0.0544)*	*(0.0023)*		
2008	0.0800	0.0612	0.0321	53,949	0.0026	0.2496	0.0165	0.0485	26,749	0.0063
	(0.0177)	*(0.0179)*	*(0.0007)*			*(0.0359)*	*(0.0354)*	*(0.0015)*		
2009*	0.0715	0.0787	0.0291	42,864	0.0030	0.1311	0.0441	0.0476	21,229	0.0025
	(0.0225)	*(0.0218)*	*(0.001)*			*(0.0442)*	*(0.045)*	*(0.0019)*		

Year	C. Separations, full-time workers					D. Separations, part-time workers				
	Change in total employment		Constant	# of obs.	R^2	Change in total employment		Constant	# of obs.	R^2
	Positive regime	Negative regime				Positive regime	Negative regime			
1994	-0.0346	-0.0540	0.0308	56,227	0.0016	-0.0864	-0.0879	0.0585	20,904	0.0016
	(0.0147)	*(0.0143)*	*(0.0006)*			*(0.0521)*	*(0.0509)*	*(0.0022)*		
1995	-0.0207	-0.0871	0.0294	56,529	0.0031	-0.1259	0.0123	0.0599	20,719	0.0010
	(0.0136)	*(0.0132)*	*(0.0006)*			*(0.0484)*	*(0.0489)*	*(0.0021)*		
1996*	-0.0454	-0.0923	0.0299	50,508	0.0034	-0.1195	-0.1002	0.0607	18,823	0.0016
	(0.0167)	*(0.017)*	*(0.0007)*			*(0.0685)*	*(0.0711)*	*(0.0029)*		
1997	-0.0170	-0.0865	0.0310	54,106	0.0025	-0.0174	-0.1396	0.0610	21,244	0.0012
	(0.0152)	*(0.0146)*	*(0.0006)*			*(0.0573)*	*(0.0558)*	*(0.0024)*		
1998	-0.0129	-0.0996	0.0288	56,707	0.0032	0.0274	-0.1606	0.0533	22,106	0.0010
	(0.0143)	*(0.0136)*	*(0.0006)*			*(0.0592)*	*(0.0576)*	*(0.0025)*		
1999*	-0.0306	-0.0747	0.0289	48,330	0.0017	-0.1259	-0.1142	0.0566	19,360	0.0027
	(0.0195)	*(0.0193)*	*(0.0008)*			*(0.0573)*	*(0.059)*	*(0.0025)*		
2000	-0.0163	-0.0893	0.0298	54,726	0.0023	0.1829	-0.1863	0.0543	22,925	0.0000
	(0.0156)	*(0.0151)*	*(0.0006)*			*(0.2903)*	*(0.297)*	*(0.0126)*		
2001	-0.0380	-0.0529	0.0321	52,169	0.0018	-0.1375	-0.0161	0.0635	22,381	0.0013
	(0.0154)	*(0.0142)*	*(0.0007)*			*(0.0513)*	*(0.0493)*	*(0.0022)*		
2002*	-0.0258	-0.1221	0.0283	47,385	0.0041	-0.1361	-0.0257	0.0625	20,162	0.0015
	(0.0173)	*(0.018)*	*(0.0007)*			*(0.0545)*	*(0.0588)*	*(0.0024)*		
2003	-0.0035	-0.0881	0.0300	52,077	0.0016	0.0468	-0.0930	0.0552	23,215	0.0004
	(0.0171)	*(0.0169)*	*(0.0007)*			*(0.0446)*	*(0.0449)*	*(0.0019)*		
2004*	-0.0006	-0.0516	0.0288	45,855	0.0004	-0.1064	-0.1006	0.0572	21,243	0.0017
	(0.0217)	*(0.0205)*	*(0.0009)*			*(0.0599)*	*(0.0614)*	*(0.0026)*		
2005	-0.0128	-0.0392	0.0308	49,084	0.0004	0.1750	-0.2030	0.0511	22,943	0.0004
	(0.0196)	*(0.0191)*	*(0.0008)*			*(0.0997)*	*(0.0994)*	*(0.0043)*		
2006	-0.0312	-0.0756	0.0305	50,520	0.0019	0.0172	-0.0668	0.0559	24,047	0.0003
	(0.0178)	*(0.0175)*	*(0.0008)*			*(0.0427)*	*(0.0418)*	*(0.0018)*		
2007*	-0.0796	-0.0504	0.0341	45,936	0.0024	-0.0589	-0.0630	0.0581	22,385	0.0006
	(0.0205)	*(0.0204)*	*(0.0009)*			*(0.0588)*	*(0.0603)*	*(0.0026)*		
2008	-0.0439	-0.1089	0.0312	53,949	0.0028	-0.0257	-0.1543	0.0527	26,749	0.0024
	(0.0187)	*(0.019)*	*(0.0008)*			*(0.0388)*	*(0.0382)*	*(0.0016)*		
2009*	-0.0898	-0.0015	0.0346	42,864	0.0013	-0.0309	-0.0887	0.0525	21,229	0.0010
	(0.0229)	*(0.0222)*	*(0.001)*			*(0.0464)*	*(0.0472)*	*(0.002)*		

Year	E. Average hour change, full-time workers					F. Average hour cahnge, part-time workers				
	Change in total employment		Constant	# of obs.	R^2	Change in total employment		Constant	# of obs.	R^2
	Positive regime	Negative regime				Positive regime	Negative regime			
1994	0.8879	0.8524	0.0007	56,227	0.4654	0.7909	0.7969	0.0059	20,904	0.1815
	(0.0123)	*(0.012)*	*(0.0005)*			*(0.0397)*	*(0.0389)*	*(0.0017)*		
1995	0.9098	0.8789	0.0020	56,529	0.4767	0.7394	0.9048	0.0085	20,719	0.1924
	(0.0124)	*(0.0121)*	*(0.0005)*			*(0.039)*	*(0.0394)*	*(0.0017)*		
1996*	0.8932	0.7939	-0.0016	50,508	0.4409	0.7575	0.7239	-0.0026	18,823	0.1602
	(0.0134)	*(0.0137)*	*(0.0006)*			*(0.0429)*	*(0.0445)*	*(0.0018)*		
1997	0.9078	0.8515	0.0018	54,106	0.4407	0.8112	0.7462	0.0014	21,244	0.1457
	(0.0134)	*(0.0129)*	*(0.0006)*			*(0.0439)*	*(0.0428)*	*(0.0019)*		
1998	0.8976	0.8572	0.0017	56,707	0.4790	0.7910	0.7710	0.0032	22,106	0.1655
	(0.0121)	*(0.0115)*	*(0.0005)*			*(0.0399)*	*(0.0388)*	*(0.0017)*		
1999*	0.8447	0.8385	0.0016	48,330	0.4002	0.6897	0.8163	0.0030	19,360	0.1451
	(0.0153)	*(0.0151)*	*(0.0006)*			*(0.0455)*	*(0.0468)*	*(0.002)*		
2000	0.8947	0.8162	0.0015	54,726	0.4546	0.7680	0.7996	0.0034	22,925	0.1905
	(0.0125)	*(0.0121)*	*(0.0005)*			*(0.0351)*	*(0.0359)*	*(0.0015)*		
2001	0.9062	0.8947	0.0023	52,169	0.4811	0.7581	0.8291	0.0040	22,381	0.1715
	(0.0134)	*(0.0123)*	*(0.0006)*			*(0.0399)*	*(0.0383)*	*(0.0017)*		
2002*	0.9477	0.7840	-0.0010	47,385	0.4301	0.8104	0.7513	-0.0075	20,162	0.1727
	(0.0145)	*(0.0151)*	*(0.0006)*			*(0.0408)*	*(0.044)*	*(0.0018)*		
2003	0.9031	0.8605	0.0024	52,077	0.4685	0.8835	0.7728	0.0006	23,215	0.1912
	(0.0127)	*(0.0125)*	*(0.0005)*			*(0.0374)*	*(0.0376)*	*(0.0016)*		
2004*	0.8612	0.8216	-0.0025	45,855	0.3895	0.7337	0.7488	-0.0027	21,243	0.1590
	(0.0161)	*(0.0153)*	*(0.0007)*			*(0.0402)*	*(0.0411)*	*(0.0017)*		
2005	0.9028	0.8432	-0.0005	49,084	0.3984	0.8864	0.7214	-0.0015	22,943	0.1831
	(0.0152)	*(0.0148)*	*(0.0007)*			*(0.0375)*	*(0.0374)*	*(0.0016)*		
2006	0.9101	0.8339	-0.0032	50,520	0.4248	0.8124	0.7641	0.0012	24,047	0.1604
	(0.0144)	*(0.0141)*	*(0.0006)*			*(0.0392)*	*(0.0384)*	*(0.0017)*		
2007*	0.9378	0.8195	-0.0038	45,936	0.4154	0.8857	0.8257	-0.0024	22,385	0.2020
	(0.016)	*(0.0159)*	*(0.0007)*			*(0.0392)*	*(0.0403)*	*(0.0017)*		
2008	0.8625	0.8120	-0.0009	53,949	0.3931	0.7288	0.7223	0.0017	26,749	0.1465
	(0.0133)	*(0.0135)*	*(0.0006)*			*(0.0345)*	*(0.0341)*	*(0.0015)*		
2009*	0.8187	0.9358	0.0036	42,864	0.4034	0.8125	0.8076	-0.0005	21,229	0.1777
	(0.0174)	*(0.0169)*	*(0.0007)*			*(0.0424)*	*(0.0431)*	*(0.0019)*		

Data management process

(a) MLS

For labelling variables and pooling the data, we use *label_kam.do* (English label can be used through *label_english.do*). Then data is constructed by *consistentdata_quarterly.do*. The sample reduction process is as follows.

(1) raw data 5,796,618

(2) drop 28 due to duplicated identification number

(3) drop 4 due to missing industry classification

(4) drop 44 due to miss classification of firm size

(5) drop 360 due to miss classification of establishment size

(6) drop 450,181 duet to inconsistency of identification number and number of employment or lacking previous observation (impossible to take change or difference).[25]

(7) drop 129 due to negative stock of employment of parttimer (or fulltimer) at the beginning of period

(8) drop 87 due to average hour of part timer (or full timer) is negative

(9) drop 73 due to negative hiring of part timer (or full timer)

(10) drop 114 due to negative separation of part timer (or full timer)

Here, the sample size is 5,345,598 (*maikin03_quarterly2.dta*). During the actual calculation process, major drop of sample is as follows (*protocol_nonparametricanalysis_v1_quarterlyJPN_1Dec.do*).

(11) drop 3,469,111 to shrink quarterly data

(12) drop 368,378 due to lack of both of employment change and total hour change

Here the sample size is 1,508,162 (*temp.dta* for analysis; still 82,596 is missing industry or firm size classification)

(b) ETS

For labelling and pooling the data, we use *variablename_ETS_2011.do*. For data construction process, see *ETS_yearly.do*. The sample reduction process is as follows.

25 . Although the Ministry checks the consistency of the employment and worker flow figures, inconsistencies may arise due to the recycling of firm identification numbers and possibility that different firms are incorrectly linked over time.

(1) pooled establishment sample 220,339 (*est_19912009_est.dta*)

(2) merging outflow ratio 220,381

(3) drop 21,380 due to lack of half of year

(4) drop 12,688 due to public sector

(5) drop 20,401 due to consistency of number of employees between the end of first half and the beginning of second half

(6) drop 6 due to duplication of identification number

Here the sample size is 165,906 (*employment_trend.dta*). Then construct variables for the analysis.

(7) drop 2 due to lack of employment change

The sample size of data is 165,904 (*dataset1.dta*).