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Why Has the Fraction of Contingent Workers Increased?

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Abstract

This paper explains the secular increase of contingent workers in Japan whose share of employment increased from 17 to 34 percent between 1986 and 2008. Changes in labor-force and industrial compositions explain about one quarter of the increase of contingent workers. The uncertainty of product demand and the introduction of information and communication technologies increased firms' usage of contingent workers. The increase of contingent workers was concentrated among new entrants to the labor market, male workers of younger cohorts, and female workers of all cohorts, suggesting that the declining importance of the long-term employment relationship is a major cause for the increase of contingent workers.

Key Words: Contingent Workers, Female Labor Supply, Uncertainty, ICT, Japan

JEL Classification Code: J23 (Labor Demand, Labor Supply)

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I. **Introduction**

The fraction of contingent workers in Japan's total employment steadily increased from 17 percent in 1986 to 34 percent in 2008 (Figure 1). This secular increase of contingent employment in Japan is perceived as a sign of declining job stability. Indeed, in the aftermath of the financial crisis in 2008, about 250,000 contingent workers had lost their jobs by the end of year 2009 (Labor and Welfare Ministry of Health, 2010). In addition to having less job stability, contingent workers tend to receive a lower hourly wage and fewer job trainings (Julen Esteban-Pretel et al., 2011). Thus, an increase of contingent workers is considered to increase the tension between regular and contingent workers, and some legislators propose an act prohibiting the use of temporary staffing in the manufacturing and non-manufacturing sectors, except for 26 occupations that require "specialized" skills (*Rodou Seisaku Shingikai Toshin* February 24, 2010). Opponents argue that passing this act will reduce disadvantaged workers' employment opportunities, based on a presumption that an increase of contingent workers reflects changing labor-market conditions over the last 20 years. To assess this policy debate objectively, we need a good understanding of forces behind the increase of contingent workers.

Despite heightened attention to the increasing number of contingent workers, we have only limited knowledge of the reasons for the increase. Global factors may have contributed to this increase, because the upsurge in the fraction of contingent workers in Japan coincides with the experience of many other developed countries, such as the US, the UK, continental European countries, and South Korea (Organisation for Economic Co-operation and Development, 2002). On the labor-demand side, factors such as the need for a workforce that can be spontaneously adjusted to the fluctuation of product demand is identified as an important factor (Peter Cappelli and David Neumark, 2004, Susan Houseman, 2001, Susan Houseman and Machiko Osawa, 2003, Masayuki Morikawa, 2010, Yukako Ono and Daniel G. Sullivan, 2006, Organisation for

Economic Co-operation and Development, 2008, Matt Vidal and Leann M. Tigges, 2009). On the supply side, the increase of female labor-force participation and the consequent demand for flexible work-schedule arrangements are pointed out (Noel Gaston and Tomoko Kishi, 2007, Susan Houseman and Machiko Osawa, 1995, Nobuko Nagase, 2003).

In addition to these global factors, Japan-specific factors may be also important. Japan used to be and still is characterized by a strong attachment between firms and workers, as evidenced by longer average job tenure and a steeper tenure-earnings profile than those of many other developed countries (Robert A. Hart and Seiichi Kawasaki, 1999). This strong attachment has helped foster an accumulation of human capital whose cost is financed by firms. Because of the two-decades-long stagnation of the Japanese economy since the early 1990s, the rationale for the so-called Japanese employment system is claimed to be undermined (Junya Hamaaki et al., 2010). Since regular workers are confined in the nexus of implicit contracts and protected by labor law, adjustments among regular workers are sluggish. In this equilibrium, firms have incentives to absorb temporary demand shocks by hiring contingent workers without future commitment. Thus, the increase of contingent workers arguably mirrors the decline of long-term employment practices in Japan.

The aim of this paper is to account for the increase of contingent workers in the Japanese economy. First, the relative importance of demand and supply factors is assessed based on both wage and labor-hour quantity of contingent workers relative to regular workers. The analysis, based on the Basic Survey of Wage Structure, reveals that the wage of contingent workers relative to regular workers' was stable between 1989 and 2008, while the fraction of contingent workers among employed workers steadily increased. This finding implies that shifts in both demand and supply of contingent workers account for the increase of contingent workers.

Next, we separately investigate the causes for supply and demand shifts. On the labor-supply

side, the increase in the female labor-force participation rate and women's demand for flexible work schedules are often pointed out. To assess this hypothesis, the increase of contingent workers is decomposed into changes in the demographic compositions of workers and changes within demographic groups. On the labor-demand side, it is often argued that the shift of industrial composition from the manufacturing sector to the service sector contributed to the increase of contingent workers, because the service sector requires more flexible staffing to accommodate demand fluctuation. To assess the impact of worker and industry compositions in the labor market on shifts of labor supply and demand for contingent workers, we rely on the Labor Force Survey, 1986-2008.

The analysis reveals that increased female labor-force participation and industries' compositional changes partly explain the increase of contingent workers, but these compositional changes explain one quarter of the increase of contingent workers at most. The other three quarters of the change occurred within a demographic group and an industry. The cohort-level analysis reveals that the increase of contingent workers is concentrated among recent cohorts of male workers and all cohorts of female workers who are new entrants into the labor market. This finding suggests that a shrinking of the population that enters the traditional long-term employment is the major cause for the increase of contingent workers.

To further analyze the force behind the demand for contingent workers, we also employ a firm survey, Basic Survey of Firms' Activity, 1995-2007. The analysis reveals that uncertain sales growth is a significant determinant of the decision to hire contingent workers, and the pattern of contingent workers' employment adjustment demonstrates that contingent workers are hired to buffer demand shocks. This finding offers further support to our hypothesis that contingent workers are not included in the traditional long-term employment relationship.

The rest of paper is structured as follows. Section 2 introduces several definitions of contingent

workers and overviews a time series of the fraction of contingent workers among employees. Section 3 implements a demand-supply analysis and quantifies the extent to which changes of the demographic and industrial composition explain the increase of contingent workers. In addition, a cohort-level analysis is implemented. Section 4 examines the effect of uncertainty on the use of contingent workers, based on firm-level data. The last section provides the conclusion.

II. Capturing contingent workers by several definitions

Contingent workers are workers whose employment can be adjusted by employers at a lower cost compared to regular workers. This notion of an unstable relationship between employers and employees can be captured through several dimensions of the employment relationship. This paper employs various definitions of contingent workers, because different statistics define contingent workers in unique ways. Government statistics that capture contingent workers most comprehensively are generated from the Labor Force Survey by the Statistics Bureau of the Ministry of General Affairs and Communications. The Labor Force Survey collects the labor-force status of 100,000 individuals age 15 and over from 40,000 households every month. The survey records the hours worked in the previous week, the period of the respondent's employment contract, and under what employment classification the respondent is employed in the workplace, if he or she is employed.

Based on Labor Force Survey statistics, we identify three definitions of contingent workers. To capture employees who work shorter hours than regular workers, we first define a contingent worker as an employee who works 35 hours per week or less. The second definition is based on contract period. An employee who works under a contract that lasts for one year or less is defined as a contingent worker. This second definition of contingent workers is used as the definition of temporary workers by Organization for Economic Co-operation and Development

(Organisation for Economic Co-operation and Development, 2002). The third definition is based on how a worker is categorized in the workplace. Regular full-time workers without a specific term contract in Japanese workplaces are typically called *Seishain*, which stands for a typical employee. Some workers, however, are not classified as *Seishain*, even among the workers who work full-time without a term contract. These workers who are not classified as *Seishain* include *Part-time, Arubaito, Keiyaku Shain, and Shokutaku*, who are hired and paid directly by employers, and *Haken Shain*, who are hired by temporary-work agencies and dispatched to the establishments where they work. The distinction between *Seishain* and non-*Seishain* lies mainly in the difference of their job career. *Seishain* are implicitly assumed to continue working for the current employer for longer period, and firms tend to protect their employment against negative economic shocks to guard a mutually trusting relationship between employers and employees. (Ryo Kambayashi, 2010) emphasizes the importance of this distinction in terms of firms' human-resource management and reports that the distinction between *Seishain* and non-*Seishain* explains participation in firm-initiated training, even after controlling for the contract period and hours worked.

Table 1 tabulates hours worked and contract period by workers' career classification. Most regular workers work full-time and are employed under a permanent contract. It is worth noting, however, that among contingent workers, about 45 percent (=11.78 percent / 26.37 percent) work 35 hours per week or more. It is also notable that about 50 percent (=13.38 percent / 26.53 percent) of contingent workers are employed under a contract that extends for one year or longer. Thus, contingent workers are not necessarily part-time or temporary workers.

Figure 1 Panel A reports the percentage of contingent workers among all employees based on the three definitions. The number of employees who work 35 hours or less has steadily increased, from less than 10 percent in 1986 to around 22 percent in 2002, but it fluctuates around this

percentage after 2002. Workers with employment contracts of one year or less accounted for about 10 percent in 1986 and about 14 percent in 2008. The fraction of workers who are categorized as non-*Seishain* has increased from 16 percent to 33 percent during this same period. These trends suggest that an increase in the number of workers who work shorter hours could partly explain the recent increase of contingent workers, but shorter contract periods cannot explain it.

Grasping the importance of contingent workers among all employed workers based on head counts may disguise its importance, because contingent workers work fewer hours than regular workers. To avoid this problem, Figure 1 Panel B reports the percentage of hours worked by contingent workers among the total hours worked by all workers. Measured in hours worked, the importance of contingent workers is similarly observed.

III. Demand-Supply Analysis

a. Relative importance of demand and supply shifts

An increase of contingent workers in the economy can potentially be explained by shifts in labor demand, labor supply, or both. Increased uncertainty or diminished future prospects on firms' product demand may have increased labor demand for contingent workers, while female workers' enhanced labor-force participation may have increased the supply of contingent workers. To assess the relative importance of demand and supply shifts, we examine a time series of the hourly wage of contingent workers relative to regular workers.

Since the Labor Force Survey only records annual earnings in brackets in its special survey, calculating hourly wage is erroneous. Thus a further investigation of wage utilizes the Basic Survey of Wage Structure, an establishment survey conducted by the Ministry of Health, Labor and Welfare that records over one million workers' hours worked and pay in June of every year.

The survey asks establishments to transcribe randomly sampled individual workers' hours and pay from their payroll; thus the hourly rate of pay calculated from this information is accurate. This survey defines contingent workers by the number of hours worked. Those workers who work less than regular workers at an establishment are defined as part-time workers.

Figure 2 shows the fraction of part-time workers and the relative wage of part-time workers to that of full-time workers over the past two decades. The relative wage of part-time workers has been stable during the sample period, whereas the fraction of part-time workers substantially increased. Thus, the recent increase in part-time workers can be explained by increases in both the demand and supply of part-time workers.

b. Female Labor-Force Participation and Supply Shift

The increase of female workers in the labor force could potentially explain the labor-supply shift of contingent workers. Changing social norms and the emergence of market substitutes for household production have reduced the reservation wage of married female workers (Jiro Nakamura and Atsuko Ueda, 1999). At the same time, low- and medium-skilled married workers are confined to supply labor to the contingent labor market because of institutional settings, such as the spousal tax deduction and the social-security tax systems (Yukiko Abe and Fumio Ohtake, 1997, Nobuko Nagase, 2003, Ken Yamada, 2011). Figure 3 demonstrates the increase of female workers among all workers between 1986 and 2008 and that the propensity for working as contingent workers remains persistently high among female workers. Thus the increase of the female proportion in total employment mechanically increases the fraction of contingent workers in the labor force.

The educational and age composition of workers also changed between 1986 and 2008, as evidenced by Table 2, which is based on the Labor Force Survey. Among male workers, the

fraction of college-educated workers has increased. As for age structure, the number of workers ages 60 and above has increased. Among female workers, we find similar trends of an increase in college-educated workers and workers over age 60.

Given employed workers' changing demographics, the analysis below decomposes the increase of contingent workers into the change of demographic composition of workers and the change within each demographic group.

Suppose that the contingent status of individual worker *i* in year *t*, which is denoted as y_{it}, depends on the vector of demographic characteristics x_{it}. Then the contingent status y_{it} is denoted as:

$$y_{it} = x_{it}\beta_t + u_{it},$$

where β_t relates demographic characteristics with the probability of contingent status. The change of the fraction of contingent workers is decomposed as:

$$\begin{aligned}\mathrm{E}(y_{it}|t=1) - \mathrm{E}(y_{it}|t=0) &= \mathrm{E}(x_{it}\,|\,t=1)\beta_1 - \mathrm{E}(x_{it}|t=0)\beta_0 \\ &= \mathrm{E}(x_{it}|t=0)(\beta_1-\beta_0) + [\mathrm{E}(x_{it}|t=1) - \mathrm{E}(x_{it}|t=0)]\beta_1\end{aligned}$$

The first term expresses the change of the probability of being a contingent worker within a demographic group. This term is called the within-group effect. The second term expresses the effect of the change of labor-force composition. This term is called the compositional effect.

Table 3 reports the regression coefficients of the contingent-status dummy variable on demographic characteristics. The increase of intercepts over the years indicates that male high-school or junior-high-school graduates / ages between 15 and 19 / not married are becoming more likely to work as contingent workers. Older male workers are less likely to work as contingent workers, except for those over age 60. The coefficients for the female dummy increased over years, reflecting the fact that more female workers are participating in the labor force as contingent workers. The fraction of workers who work as contingent workers was

heterogeneous across ages among female workers in 1986. For example, females between the ages of 34 and 39 were more likely to work as contingent workers, but this heterogeneity became less prevalent over the years. This trend reflects the fact that contingent work has changed from jobs for female workers with family commitments to jobs for female workers of all age groups.

Figure 4 Panel A reports the results of decomposition exercises. The change of the demographic composition of workers explains about one third of the increase of contingent workers until the mid 1990s, but it does not explain the rapid increase of contingent workers after that time. Overall, the change of the demographic composition of workers explains about one fifth of the increase in contingent workers between 1986 and 2008.

c. Change of Industrial Composition and Demand Shift

Table 4 reports the industrial composition of employees between 1986 and 2008. The manufacturing sector consisted of about 30% of total employment in 1986, but the number declined to about 20% in 2008. In contrast, the service sector hired about 22% of total employees in 1986, and the figure increased to 32% in 2008. The shares of other industries were stable during the period. The dependence on contingent workers differs significantly across industries. Table 5 reports the regression coefficients of the contingent-worker dummy variable on the industry dummy variables. First, it is noticeable that the reliance on contingent workers was stronger in 2008 than in 1986 in manufacturing, transport and communications, wholesale/retail trade and restaurants, finance/insurance and real estate, and the service and government sectors. Table 5 also indicates that service industries demanded more contingent workers than the manufacturing sector over the entire sample period. Thus, the increase of the service sector "mechanically" increases the fraction of contingent workers in the whole economy.

To decompose the increase of contingent workers into the increase within industries and the

change of industrial composition, we repeat the decomposition exercise with respect to industries. Suppose that the contingent status of individual worker *i* in year *t*, which is denoted as y_{it}, depends on the vector of industry dummy variables z_{it}. Then the contingent status y_{it} is denoted as:

$$y_{it} = z_{it}\gamma_t + v_{it},$$

where γ_t relates industry dummies with the probability of contingent status. The change of the fraction of contingent workers is decomposed as:

$$E(y_{it}|t=1) - E(y_{it}|t=0) = E(z_{it}|t=1)\gamma_1 - E(z_{it}|t=0)\gamma_0$$

$$= E(z_{it}|t=1)(\gamma_1 - \gamma_0) + [E(z_{it}|t=1) - E(z_{it}|t=0)]\gamma_0.$$

The first term is the within-industry effect, and the second term is the composition effect. Figure 4 Panel B illustrates the results of this decomposition exercise. The change of industrial composition explains up to a 2-percentage-point increase of contingent workers from 1986 to 2008, while the percentage of contingent workers increased by 16 percentage points. This result indicates that the change of relative demand for contingent workers within industries played a significant role.

What caused the increase of contingent workers within an industry? Looking at Table 5 again, increases of contingent workers within the wholesale and retail trade, and within service industries, are particularly significant. To understand this increase, occasional government surveys called *Comprehensive Survey on Diversifying Employment Forms* are useful (Labor and Welfare Ministry of Health, 2007, 2003). This survey asks employers the reasons why they employ contingent workers by letting them choose up to 3 of 13 possible choices, ranging from "cannot find regular employees" to "replacement of regular workers who are on maternity or elderly care leave." Employers in wholesale and retail trade and in service industries are far more likely to choose "to accommodate long operation hours" and "to accommodate hourly or daily

demand fluctuations" than employers in other industries. For example, 39.4% of employers in the retail industry and 35.9% of employers in the restaurant and lodging industry chose "to accommodate long operation hours" as a reason to hire contingent workers, while 18.9% of employers in all industries chose this as a reason. Similarly, 51.9% of employers in the restaurant and lodging industry chose "to accommodate hourly or daily demand fluctuations" as a reason to hire contingent workers, while 31.8% of employers in all industries chose this as a reason. Other choice probabilities of the wholesale/retail trade and service industries are not particularly different from those of other industries. This side evidence points to the importance of consumers' changing preferences over the service hours or the increase of hourly or daily demand fluctuation as an explanation for the increase of contingent workers.

The analysis heretofore separately assessed contributions of changes in demographic and industrial compositions to the increase of contingent workers. What then is the total effect of demographic and industrial compositions on the increase of contingent workers? Figure 4 Panel C reports the results of the decomposition exercise. The change of demographic and industrial compositions explains up to one third of the increase of contingent workers until the mid-1990s, but it does not explain the increase after that time. While contingent workers increased by 16 percentage points between 1986 and 2008, about 4 percentage points is explained by compositional changes. Thus compositional change explains only one quarter of the increase of contingent workers. The discussion in the next section provides an explanation for the rest of the increase.

d. Two-Decades-Long Stagnation and the Fall of Japanese Employment System

Several papers report that the two-decades-long stagnation of the Japanese economy since the early 1990s has undermined so-called Japanese-employment practices, which are often

characterized by long-term employment and a seniority wage system (Junya Hamaaki, Masahiro Hori, Saeko Maeda and Keiko Murata, 2010, Robert A. Hart and Seiichi Kawasaki, 1999, Takao Kato and Ryo Kambayashi, 2009). Literature emphasizes the importance of mutual trust between employers and employees so that firms can induce employees' effort to accumulate firm-specific human capital. Even when the return to firm-specific human capital deteriorates, firms hesitate to renege on existing implicit contracts by cutting the employment of regular workers, because it would destroy the trust with its employees and result in decreased productivity of its regular workers. Instead of adjusting existing workers, firms are inclined to reduce the fraction of workers who enter into this long-term relationship. With this generational adjustment, firms can reduce the fraction of costly regular workers without undermining the beneficial trust relationship.

If firms keep ongoing relationships with existing regular workers, the increase of contingent workers should be concentrated among recent-born cohorts. As is well known, we cannot decompose the increase of contingent workers into age, birth cohorts, and year effects because these three effects are linearly dependent. By imposing a functional form assumption on the effect of age on the probability to be contingent workers, however, we can estimate the following decomposition equation.

$$y_{it} = f(age_{it}) + \delta_c + \delta_t + X_{it}\beta + u_{it},$$

where y_{it} takes one if individual i in year t is a contingent worker, $f(age_{it})$ is a continuous function of age that is approximated by a quartic function,[1] δ_c is the birth-year cohort fixed effect, δ_t is the year fixed effect, and X_{it} is the set of other control variables, such as educational attainment, birth-month dummies, and industry dummies. To assure that the fraction

[1] The choice of this functional form is arbitrary, but the quartic function should be flexible enough to capture the complex life-time choice of contingent employment, particularly among female workers.

of contingent workers changes continuously with respect to age, we restrict our sample ages to between 25 and 59 to avoid a discontinuous decrease of contingent status at the time of school graduation and the discontinuous increase of the contingent status at the time of mandatory retirement from career jobs at the age of 60.

Figure 5 Panel A draws age profiles of contingent status for both sexes approximated by quartic functions. The probability to be a contingent worker stays low until age 55 for male workers and then increases for these workers. This may represent a gradual retirement process from career jobs among male workers. The probability increases after age 25 and reaches its peak at age 42 for female workers. This profile reflects that many female workers choose contingent status to balance their market work and household duties.

Figure 5 Panel B plots the coefficients for birth-cohort dummy variables and Panel C plots the coefficients for year dummy variables. The decomposition exercise renders different results for males and females.

Panel B shows that, for male workers, cohorts born after 1964 are increasingly more likely to be contingent workers compared with cohorts born in 1963 or before. In contrast, Panel C indicates that the contribution of the year effects is almost zero. The fact that the increase of male contingent workers is all explained by the cohort effect is consistent with the hypothesis that the stagnation of the Japanese economy reduces the fraction of workers who enter the long-term employment relationship.

The results for females reported in Figure 5 Panels B and C sharply contrast with the results for males. Panel B implies that cohort effects did not contribute to increased contingent employment compared with females born in 1955. In contrast, Panel C suggests that the coefficients for year dummy variables for recent years are increasing. The combination of Panels B and C tells us that the fraction of contingent workers has increased uniformly across birth cohorts in recent years

among female workers.

Because the so-called Japanese employment system based on stronger employer-employee attachments used to mainly cover male workers (Akira Wakisaka, 1997), the finding that the cohort effects only explain the increase of contingent workers among male workers is very reasonable. Female workers, who are largely excluded from the Japanese employment system, experience the increase of contingent status mainly because of year effects. The fall of the Japanese employment system is an underlying force that has driven up the demand for contingent workers, including female workers.

To assess the relative contributions of age, cohort, and year effects on the increase of contingent workers, the increase in the fraction of contingent workers is decomposed into three effects. Note that the fraction of contingent workers in year t is expressed as:

$$\bar{y}_t = \hat{f}(\overline{age}_t) + \bar{\hat{\delta}}_{c,t} + \hat{\delta}_t + \bar{X}_t\hat{\beta},$$

where $\overline{age}_t$ is the average age in year t, $\bar{\hat{\delta}}_{c,t}$ is the average cohort fixed effect in year *t*, and $\bar{X}_t$ is the average of other controls. The $\hat{f}, \hat{\delta}_t$ and $\hat{\beta}$ are estimated functional forms or parameters. The age, cohort, and year effects are respectively defined as:

$$\bar{y}_t^{age} = \hat{f}(\overline{age}_t), \qquad \bar{y}_t^{cohort} = \bar{\hat{\delta}}_{c,t}, \qquad \bar{y}_t^{year} = \hat{\delta}_t.$$

Figure 6 Panel A illustrates each effect for male workers relative to each effect in 1986. The cohort effect has consistently contributed to the increase of contingent workers. The sudden increase of the year effect's contribution from 2002 suggests that the fraction of contingent workers increased for all cohorts groups from 2002. It is notable that until 2002, if there had been no entry of new cohorts into the labor market, the fraction of contingent workers would have decreased. The change of workers' age composition has not affected the fraction of contingent workers at all.

Figure 6 Panel B demonstrates the decomposition for female workers. Contrary to the results for male workers, all of the increase in the fraction of contingent workers is explained by year effects. The cohort and year effects even contributed to a *decrease* in the fraction of contingent workers. These results imply that the fraction of contingent workers has increased among female workers across cohorts. This is a natural result, considering that female workers often reenter the labor market as contingent workers after career interruptions (Nobuko Nagase, 2003, Jiro Nakamura and Atsuko Ueda, 1999).

In sum, the cohort analysis reveals that the increase of contingent workers between 1986 and 2008 was concentrated among new entrants into the labor market: recent cohorts of male workers and all cohorts of female workers. This finding suggests that the entry port of the long-term employment relationship has shrunk in the Japanese labor market.

IV. Demand Analysis using Firm Data

Results of decomposition exercises indicate the importance of within-industry labor-demand shifts toward contingent workers relative to regular workers over the period between 1986 and 2008. This section further analyzes why firms became more dependent on contingent workers, using firm-level panel data. Previous studies report that firm-level sales-growth volatility has increased in recent years, based on data from US listed companies, pointing out that exposure to international competition increases the volatility of firms' performance (Diego Comin and Sunil Mulani, 2006, Diego Comin and Thomas Philippon, 2006). The other strand of studies argue that the penetration of information and communication technology (ICT) enables firms to adopt new production organizations in a short period of time and intensify the degree of market competition (Erik Brynjolfsson et al., 2007). Stringent competition subsequently makes firms' performance more volatile.

Japanese firms try not to fire existing regular workers to avoid reneging on their implicit contract with employers (Takao Kato and Ryo Kambayashi, 2009). In addition, Japanese Labor Contract Law Section 16 prohibits employers from firing employees without a good reason. Court precedents indicate that judges generally apply stricter standards to firing regular workers than contingent workers. Because of these economic and legal costs associated with firing regular employees in the economic downturn, firms that face volatile future product demand hire more contingent workers (Masayuki Morikawa, 2010). Our following analysis is close to Morikawa's study, but extends the analysis by quantitatively assessing the extent to which sales-growth uncertainty can explain the increase of contingent workers.

The data set used in this section is the Basic Survey of Japanese Business Structure and Activities collected by the Ministry of Economy, Trade, and Industry (METI) of the Japanese government. This is a firm-level census survey that covers all firms hiring 50 or more employees and holding 30 million yen or more in paid-up capital or investment funds. The available data cover 10 years, every year between 1997 and 2006, and the sample size is about 25,000 firms for each year. From the data sets, we extracted each firm's total sales, data on the firm's permanent employees who were hired under a contract that extends more than a month, the year the firm was founded, the firm's prefectural location, and the two-digit code indicating the industry in which the firm operates. After excluding observations with missing sales information or inconsistent employee records, there remained 195,616 firm-year observations. This unbalanced panel is the analysis sample for estimating the demand equation for contingent workers. The caveat of this data set is that its coverage of contingent workers is incomplete. The number of workers who are hired under a contract that extends less than a month or workers who are dispatched through temporary staffing agencies is recorded only after the 2000 survey. Thus we focus only on the fraction of part-time workers among employees who work under contracts that

extend more than a month in this section. The descriptive statistics of the analysis data are reported in Table 6.

Previous studies capture the demand uncertainty that firms face by the fluctuation of sales growth around expected sales growth (Diego Comin and Sunil Mulani, 2006, Diego Comin and Thomas Philippon, 2006, Masayuki Morikawa, 2010, Yukako Ono and Daniel G. Sullivan, 2006). We follow the same approach. We assume that sales growth, $gs_{it}(= \ln s_{it} - \ln s_{it-1})$, follows a first-order autoregressive process:

(1) $$gs_{it} = \rho_i gs_{it-1} + u_i + u_t + v_{it},$$

where u_t denotes time fixed effects. Based on this specification, we calculate the following variables that approximate the uncertainty that firms face.

Volatility:

$$\begin{aligned}\mathrm{sd}[\ln s_{it} - \mathrm{E}_{t-1}(\ln s_{it})] &= \mathrm{sd}[\ln s_{it} - \mathrm{E}_{t-1}(\ln s_{it}) - \ln s_{it-1} + \ln s_{it-1}] \\ &= \mathrm{sd}[\ln s_{it} - \ln s_{it-1} - \mathrm{E}_{t-1}(\ln s_{it} - \ln s_{it-1})] = \mathrm{sd}[gs_{it} - \mathrm{E}_{t-1}(gs_{it})] \\ &= \mathrm{sd}(v_{it}) = \sigma_i\end{aligned}$$

Unexpected sale growth:

$$\ln s_{it} - \mathrm{E}_{t-1}(\ln s_{it}) = \ln s_{it} - \ln s_{it-1} - \mathrm{E}_{t-1}(\ln s_{it} - \ln s_{it-1}) = v_{it}$$

Expected growth:

$$\mathrm{E}_t(\ln s_{it+1}) - \ln s_{it} = \mathrm{E}_t(\ln s_{it+1} - \ln s_{it}) = Egs_{it+1}$$

Lagged expected growth: Egs_{it}

The determination of the fraction of contingent workers among the total number of workers in a firm, $\mathrm{cont}_{\mathrm{it}}$, is assumed to be:

(2)

$$\begin{aligned}cont_{it} = \beta_0 + \beta_1\sigma_i + \beta_2^+ v_{it-1}^+ + \beta_2^- v_{it-1}^- + \beta_3^+ Egs_{it}^+ + \beta_3^- Egs_{it}^- + \beta_4^+ Egs_{it-1}^+ + \beta_4^- Egs_{it-1}^- \\ + x_{it}\gamma + u_{it}.\end{aligned}$$

The greater the uncertainty that firms face, the larger the fraction of contingent workers is expected to be. Unexpected sales growth may well be absorbed by the adjustment of contingent workers, but positive and negative unexpected shocks are likely to have different impacts on the usage of contingent workers. To allow for different positive effects from positive and negative shocks, different coefficients are assigned for each case. The expected sales growth between t and t+1 and between t-1 and t are expected to affect the ratio of contingent workers. The coefficient signs for these variables depend on whether or not firms expect the growth to continue. If firms expect the sales growth to continue, positive expected growth reduces the usage of contingent workers. In contrast, if firms expect the sales growth will not last long, the expected growth is absorbed by an increase of contingent workers. Again, different coefficients are assigned for positive and negative expected sales growth.

The construction of uncertainty variables forces us to drop 1995, 1996, and 2007 waves from the analysis sample. Although the waves between 1995 and 2007 are available to estimate the AR(1) model for constructing the uncertainty variables, $\mathrm{E}_{94}(gs_{i,95})$ and $\mathrm{E}_{07}(gs_{i,08})$ cannot be used to estimate the equation for the determination of contingent workers.

The other explanatory variables x_{it} include the use of ICT. (Mitsuru Sunada et al., 2004) claim that ICT saves the input of regular workers by standardizing job flow and reducing the value of regular workers' accumulated experience. Also, ICT usage makes it possible to subdivide jobs and allocate some parts to contingent workers. To test whether ICT usage increases the number of contingent workers, we include a dummy variable that takes one if a respondent company uses any type of network technology. As of 1998, 68 percent of respondent companies used network technology, while the number increased to 95 percent by 2006, as shown in Table 6. To capture intense ICT usage, we also include a dummy variable that takes one if the respondent company uses ICT for commercial transactions. Only 1 percent of respondent firms answered "yes" to this

question in 1997, but the figure grew to 34 percent in 2006. Thus this variable has sufficient variation across firms, even in recent years. These variables are only available for 1998 and 2001-2006 during the sample period, and thus the analysis using these variables is limited to these years.

The results using firms in all industries are reported in Table 7. Column (1) reports the regression of the fraction of part-time employees among all employees on a constant and year dummy variables. From these regression results, 9.7 percent of employees was part-time workers in 1997, and this figure increased by 2.7 percentage points by 2006. Our aim is to explain the patterns of year dummy variables by adding explanatory variables that represent uncertainty and ICT usage. As reported in Column (2), adding industry dummy variables attenuates the coefficients for year dummy variables by about 30 percent. This implies that 30 percent of the increase of contingent workers between 1997 and 2006 is attributable to the change of industrial composition.

The result for the specification including the proxy variables for sales-growth uncertainty is reported in Column (3) of Table 7. Volatility, defined as the standard deviation of forecasting error, does not significantly explain the fraction of part-time workers. As a positive coefficient for "Shock (-)" indicates, negative shock to sales growth reduces the fraction of part-time workers. In contrast, positive coefficients for expected sales growth and lagged expected sale growth suggest that firms hire more part-time workers to accommodate future growth. Overall, firms increase part-time workers in response to expected future growth, and once the positive forecast is not realized, they accommodate the situation by reducing part-time workers. This adjustment pattern is consistent with the notion that contingent workers are used as a buffer for demand fluctuation. Firms with larger log sales amounts employ fewer part-time workers, while those with many establishments employ more of such workers. Although estimated coefficients

for uncertainty-related variables are reasonable and convincing, these variables do not seem to explain much about the increase of part-time workers, as evidenced by almost identical coefficients for year dummy variables in Columns (2) and (3). Uncertainty of sales growth well explains the cross-sectional variation of employment of part-time workers across firms, but it does not explain the time-series increase of part-time workers.

Results reported in Columns (4) through (6) assess ICT's impact on the employment of part-time workers. Because variables capturing ICT usage are limited to 1998 and 2001-2006, we first reproduce the regression with only year dummy variables. Results in Column (4) imply a steady increase of the fraction of part-time workers over the period. Column (5) reports the result after adding the proxy variables for sales-growth uncertainty. The estimated coefficients are almost identical to the results in Column (3), implying that the change of sample period does not change the estimation results regarding the effects of sale-growth fluctuations. In contrast, the estimated coefficients for the year dummy variables in Column (5) have attenuated by about 40 percent from the results reported in Column (4). This significant change of estimated coefficients implies that the change of sales-growth uncertainty, as well as the compositional change of industries, explains the growth of part-time workers between 1998 and 2006. Column (6) reports a regression result that further includes variables for internet usage. Both usage of internet and engagement in commercial transactions using internet increase the employment of part-time workers. Although adding these variables does not change the estimated coefficients for uncertainty-related variables, the coefficients for year dummy variables further attenuate from Column (5) by 40 percent. A comparison of the coefficients for the year dummy variables for Columns (4) and (6) suggests that compositional changes of industry, sales-growth uncertainty, and introduction of ICT into workplaces explain up to about 60 percent of the increase of part-time workers between 1998 and 2006.

Overall, the analysis in this section based on the Basic Survey of Japanese Business Structure and Activities points to the fact that sales-growth uncertainty and introduction of ICT into workplaces have certainly contributed to the increase of contingent workers. Firms increase the fraction of part-time workers when they expect future sale growth and reduce its fraction in the face of unexpected sales decline. Also, firms that utilize IT intensively rely more on contingent workers. Although these results confirm general perceptions and the findings from previous studies, its quantitative effect on the secular increase of contingent workers is limited**.**

V. Conclusion

In 2008, about one third of Japanese employees were contingent workers. This fraction increased from 16 percent in 1986 to 33 percent in 2008. This paper investigated factors that drive this secular trend.

First, we examined the relation between contingent status and hours worked or the period of contract, based on the Labor Force Survey. A close examination indicated that the increase of contingent workers was not characterized simply by an increase of workers who work less than 35 hours per week or under a contract that extends less than one year. Rather, the increase of contingent workers was characterized by an increase of workers who were classified as contingent workers at their workplaces. This finding suggests that the increase of contingent workers can be interpreted as an increase of workers who are not included in the implicit long-term contract of career development from the viewpoint of human-resource management.

Second, we analyzed the increase of contingent workers in a simple framework of demand and supply. The wage of part-time workers relative to regular workers calculated from Basic Survey of Wage Structure was steady, around 45 percent, during the analysis period. This steady relative-wage trend, accompanied by a secular increase of part-time workers, implies that both

demand and supply increases were behind the secular trend. Then, we quantitatively assessed the respective contributions of changes in demographic and industrial compositions for the demand and supply increases of contingent workers. The decomposition analysis indicated that one quarter of the increase of contingent workers was explained by demographic and industrial compositional changes. Another three quarters of the increase was explained by the increase of contingent workers within demographic and industrial groups. Regarding the supply factor, the increases of the fractions of contingent workers among male youth and females of all ages were respectively notable. For the demand factor, the increase of contingent workers within consumer-oriented industries, such as transport and the communication industry, wholesale and retail trade, and service industries were particularly notable. Auxiliary survey information suggested that long operating hours and demand fluctuation within a day increased the demand for contingent workers. Most importantly, we found that the increase of the fraction of contingent workers was concentrated among new labor-market entrants: male workers of younger cohorts and female workers of all cohorts.

Third, we analyzed factors that affected the demand for contingent workers, using firm-level panel data between 1997 and 2006. Estimation results indicate that firms facing uncertain sales growth rely more on contingent workers. In particular, firms that expect future sales growth hire contingent workers and fire them when the firms experience an unexpected sales decline. This finding is consistent with the notion that contingent workers are hired as a buffer for employment adjustment. Results also show that firms that use ICT intensively, particularly for the purpose of commercial transactions, hire more contingent workers than firms that do not use ICT. Although uncertainty and ICT use increase the employment of contingent workers, these factors cannot well explain the time-series increase of contingent workers.

Overall, factors that are pointed out as determinants for an increase of contingent workers, such

as workers' demographic change, compositional change of industry, uncertainty of product demand, and IT, all explain the increase of contingent workers. These factors, however, explain only about one quarter of the secular increase of contingent workers over the past two-and-a-half decades.

This result leads us to the decline of Japanese employment practices as an explanation for the secular increase of contingent workers in the economy. Japanese employment practices were once characterized by strong attachments between employers and employees that foster firm-specific human capital investment ((Masanori Hashimoto and John Raisian, 1985) for the evidence in the 1970s, (Chiaki Moriguchi, 2003) for its historical origin). Japanese firms and employees have avoided hold-up problems associated with relation-specific investment by using a reputation mechanism in a repeated game framework (Yoshitsugu Kanemoto and W. Bentley Macleod, 1992, 1989). At equilibrium, employees are given implicit assurance of secure employment and promotion opportunities, given sufficient human-capital investment. This equilibrium is persistent among many Japanese firms, even today (Takao Kato, 2001, Hiroshi Ono and Chiaki Moriguchi, 2006), but the economic stagnation that lasted for two decades decreased the importance of long-term human-capital investment. As a result, the Japanese long-term employment relationship is on a secular declining trend (Junya Hamaaki, Masahiro Hori, Saeko Maeda and Keiko Murata, 2010, Takao Kato and Ryo Kambayashi, 2009).

Accommodating this declining trend is not easy for many firms, however, because they are still benefitting from keeping the long-term employment relationship with their employees by extracting additional effort and encouraging them to accumulate firm-specific human capital. As a way to accommodate the declining macroeconomic trend without reneging on their implicit contract with core workers, firms utilize a classification of regular and contingent workers. Contingent workers are given fewer training opportunities and less job security (Toshie Ikenaga

and Daiji Kawaguchi, 2010, Japan Institute for Labor Policy and Training, 2009), and their career perspectives are perceived to be different from those of regular workers. Thus if firms fire contingent workers in an economic downturn, it does not hurt "trust" between firms and regular employees. In this way, firms can accommodate the declining macroeconomic trend without losing the trust relationship with their regular core employees. This is a reason why the cohort analysis revealed that the increase of the fraction of contingent workers is concentrated among new entrants into the labor market. Our firm data analysis also provides clear evidence that contingent workers are employed as a buffer to absorb demand uncertainty.

Our analysis provides circumstantial evidences that the increase of contingent workers is mainly explained by the fall of Japanese traditional employment practices. Definitive evidence for the causal relation between the fall of the return to firm-specific human capital and the increase of contingent workers is yet to come, but the secular increase of contingent workers cannot be understood without paying attention to the low growth rate of the Japanese economy over last two decades and the relative persistence of traditional employment practices among its core workers.

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Table 1: Cross-tabulation of classifications of workers

Career Classification	Working Hours			Contract Term		
	35 or more	Less than 35	Total	1 year or more	Less than 1 year	Total
Regular worker	1,011,028	83,327	1,094,355	1,100,296	12,095	1,112,391
(*Seishain*)	(68.02)	(5.61)	(73.63)	(72.67)	(0.80)	(73.47)
Contingent worker	174,920	217,008	391,928	202,553	199,082	401,635
(*paart*, *arubaito*, etc)	(11.78)	(14.60)	(26.37)	(13.38)	(13.15)	(26.53)
Total	1,185,948	300,335	1,486,283	1,302,849	211,177	1,514,026
	(79.79)	(20.21)	(100.00)	(86.05)	(13.95)	(100.00)

Source: Authors' calculation from Monthly Labor Force Survey, 1986-2008.

Table 2: Changes in Demographic Composition of Employed Workers

	Male			Female		
Male	1986	1996	2006	1986	1996	2006
Junior/technical college	0.048	0.071	0.100	0.134	0.230	0.276
University	0.221	0.272	0.331	0.058	0.085	0.148
Age 20-24	0.088	0.095	0.066	0.162	0.147	0.095
Age 25-29	0.123	0.133	0.120	0.112	0.139	0.128
Age 30-34	0.147	0.124	0.148	0.098	0.097	0.127
Age 35-39	0.161	0.110	0.127	0.143	0.093	0.114
Age 40-44	0.130	0.121	0.115	0.137	0.123	0.114
Age 45-49	0.113	0.136	0.102	0.119	0.150	0.109
Age 50-54	0.100	0.103	0.104	0.099	0.107	0.113
Age 55-59	0.072	0.086	0.116	0.056	0.075	0.109
Age 60 or more	0.049	0.079	0.094	0.041	0.057	0.080
Married	0.736	0.681	0.659	0.607	0.581	0.575
NOBs	25,135	24,008	58,905	15,077	16,684	46,268

Source: Authors' calculation from Monthly Labor Force Survey, 1986-2008. Only statistics for 1986, 1996 and 2006 are reported.

Note: The Labor Force Survey Special Survey was conducted once a year in February from 1986 to 2001, but it has been changed to a monthly survey. The increased sample size in 2006 is a result of this change.

Table 3: The Determinants of Contingent Status by Demographic Characteristics
OLS Regression Coefficients

	1986		1996		2006	
Junior/technical college	-0.014	(0.007)	-0.026	(0.009)	-0.029	(0.006)
University	-0.028	(0.004)	-0.023	(0.005)	-0.049	(0.004)
Age 20-24	-0.048	(0.015)	-0.111	(0.020)	-0.022	(0.018)
Age 25-29	-0.055	(0.015)	-0.132	(0.020)	-0.096	(0.018)
Age 30-34	-0.037	(0.019)	-0.138	(0.020)	-0.137	(0.017)
Age 35-39	-0.042	(0.017)	-0.130	(0.020)	-0.148	(0.018)
Age 40-44	-0.042	(0.017)	-0.132	(0.020)	-0.149	(0.018)
Age 45-49	-0.035	(0.017)	-0.129	(0.020)	-0.140	(0.018)
Age 50-54	-0.011	(0.019)	-0.131	(0.020)	-0.128	(0.018)
Age 55-59	0.056	(0.018)	-0.090	(0.021)	-0.077	(0.018)
Age 60 or more	0.291	(0.025)	0.251	(0.021)	0.376	(0.018)
Married	-0.026	(0.008)	-0.042	(0.006)	-0.099	(0.004)
Female	-0.023	(0.019)	0.087	(0.030)	0.133	(0.024)
Female × Junior/technical college	-0.053	(0.016)	-0.055	(0.011)	-0.087	(0.007)
Female × university	-0.096	(0.016)	-0.123	(0.011)	-0.138	(0.007)
Female × Age 20-24	0.062	(0.021)	0.023	(0.032)	0.013	(0.026)
Female × Age 25-29	0.156	(0.026)	0.056	(0.032)	0.070	(0.026)
Female × Age 30-34	0.174	(0.028)	0.105	(0.033)	0.135	(0.026)
Female × Age 35-39	0.296	(0.025)	0.175	(0.033)	0.175	(0.026)
Female × Age 40-44	0.269	(0.025)	0.180	(0.033)	0.215	(0.026)
Female × Age 45-49	0.248	(0.026)	0.178	(0.032)	0.184	(0.026)
Female × Age 50-54	0.159	(0.028)	0.159	(0.033)	0.164	(0.026)
Female × Age 55-59	0.135	(0.029)	0.084	(0.033)	0.099	(0.026)
Female × Age 60 over	-0.035	(0.034)	-0.134	(0.034)	-0.234	(0.026)
Female × Married	0.180	(0.013)	0.255	(0.009)	0.272	(0.006)
Intercept	0.103	(0.014)	0.203	(0.018)	0.315	(0.017)
R-squared	0.328		0.401		0.484	
NOBs	40,212		40,692		104,896	

Source: Authors' calculation from Monthly Labor Force Survey, 1986-2008. Regression coefficients for 1986, 1996, and 2006 are reported.

Note: The same note applies as in Table 2.

Table 4: Changes in Industrial Composition of Employed Workers

	1986	1996	2006
Agriculture	0.004	0.006	0.007
Forestry	0.002	0.001	0.001
Fishery	0.004	0.002	0.002
Mining	0.001	0.002	0.001
Construction	0.090	0.097	0.076
Manufacturing	0.294	0.251	0.200
Electricity, etc.	0.008	0.009	0.007
Transport and Communications	0.081	0.079	0.089
Wholesale and Retail Trade	0.202	0.197	0.209
Finance and Insurance	0.047	0.047	0.038
Services	0.215	0.262	0.322
Government	0.049	0.042	0.043
Others	0.002	0.004	0.004
NOBs	40,685	40,980	106,906

Source: Authors' calculation from Monthly Labor Force Survey, 1986-2008. Only the statistics for 1986, 1996 and 2006 are reported.

Note: The same note applies as in Table 2.

Table 5: Effect of Industrial Composition on Contingent Status

	1986		1996		2006	
Agriculture	0.380	(0.039)	0.408	(0.026)	0.489	(0.017)
Forestry	0.249	(0.045)	0.214	(0.056)	0.262	(0.047)
Fishery	0.201	(0.028)	0.161	(0.043)	0.302	(0.034)
Mining	0.034	(0.024)	0.041	(0.045)	0.100	(0.051)
Construction	0.156	(0.006)	0.130	(0.006)	0.181	(0.005)
Manufacturing	0.148	(0.004)	0.160	(0.004)	0.206	(0.003)
Electricity, etc.	0.071	(0.016)	0.051	(0.020)	0.090	(0.016)
Transport and Communications	0.065	(0.007)	0.130	(0.007)	0.200	(0.005)
Wholesale and Retail Trade	0.225	(0.006)	0.322	(0.004)	0.448	(0.003)
Finance and Insurance	0.080	(0.007)	0.127	(0.009)	0.227	(0.007)
Services	0.157	(0.004)	0.210	(0.004)	0.392	(0.002)
Government	0.100	(0.009)	0.091	(0.009)	0.157	(0.007)
Others	0.202	(0.048)	0.230	(0.030)	0.419	(0.022)
R-squared	0.170		0.224		0.354	
NOBs	40,685		40,980		106,906	

Source: Authors' calculation from Monthly Labor Force Survey, 1986-2008. Regression coefficients for 1986, 1996, and 2006 are reported.

Note: Regression coefficients of contingent status on industry dummy variables without constant are reported. Heteroskedasticity robust standard errors are in parentheses. Because of missing values in education level, the number of observations (NOBs) in Panel A is smaller than that in Panel B.

Table 6: Summary Statistics of Firm Survey

	1998		2000		2002		2004		2006	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Contingent ratio	0.105	0.169	0.118	0.185	0.125	0.198	0.128	0.204	0.124	0.201
Uncertainty	0.114	0.114	0.117	0.111	0.116	0.107	0.113	0.109	0.107	0.108
Shock (+)	0.039	0.089	0.043	0.094	0.047	0.094	0.043	0.096	0.038	0.085
Shock (-)	-0.039	0.090	-0.043	0.101	-0.047	0.106	-0.042	0.104	-0.037	0.097
Expected growth (+)	0.010	0.048	0.049	0.073	0.024	0.058	0.049	0.071	0.052	0.093
Expected growth (-)	-0.085	0.084	-0.021	0.060	-0.043	0.065	-0.020	0.057	-0.020	0.069
Lagged expected growth (+)	0.028	0.061	0.026	0.068	0.013	0.046	0.040	0.066	0.047	0.074
Lagged expected growth (-)	-0.034	0.063	-0.037	0.062	-0.062	0.078	-0.023	0.054	-0.020	0.060
Log of sales	8.805	1.303	8.720	1.324	8.722	1.326	8.673	1.372	8.737	1.385
Log of # of establishments	1.526	1.159	1.576	1.179	1.604	1.189	1.582	1.206	1.605	1.215
Internet	0.679	0.467	-		0.887	0.317	0.931	0.254	0.948	0.221
E-commerce	0.010	0.101	-		0.264	0.441	0.309	0.462	0.336	0.472
NOBs	19,826		19,195		18,456		20,487		20,192	

Source: Authors' calculation from Basic Survey of Firm Structure, 1998, 2000, 2002, 2004. "Internet" is an indicator that takes one if the company uses the internet. "E-commerce" is an indicator that takes one if the company uses the internet for commercial transactions.

Table 7: Determinants of Usage of Contingent Workers

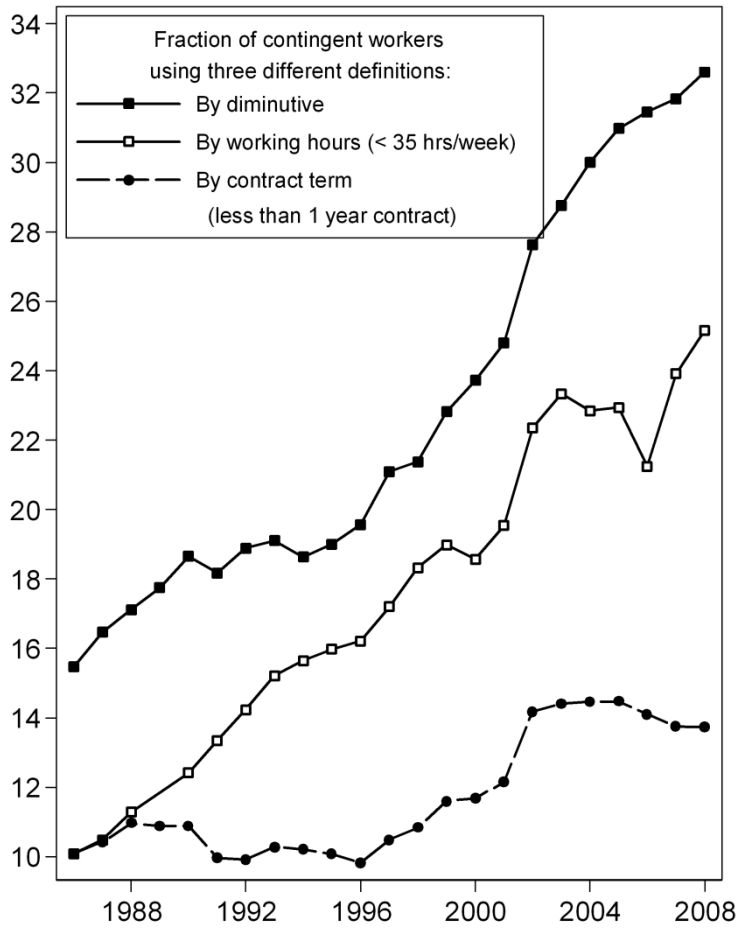
Dependent Variable: Fraction of Contingent Workers

Sample: All Industries, Basic Survey of Firm Structure, 1997-2006 for columns (1) to (3), 1998, 2001-2006 for columns (4) to (6)

	(1)		(2)		(3)		(4)		(5)		(6)	
Uncertainty					-0.001	(0.008)			0.000	(0.009)	0.001	(0.009)
Shock (+)					0.002	(0.003)			-0.004	(0.004)	-0.004	(0.004)
Shock (-)					0.032	(0.003)			0.027	(0.004)	0.028	(0.004)
Expected growth (+)					0.062	(0.008)			0.051	(0.009)	0.051	(0.009)
Expected growth (-)					-0.007	(0.007)			-0.017	(0.008)	-0.017	(0.008)
Lagged expected growth (+)					0.056	(0.008)			0.070	(0.009)	0.071	(0.009)
Lagged expected growth (-)					0.004	(0.007)			-0.001	(0.010)	-0.001	(0.010)
Log of sales					-0.015	(0.001)			-0.015	(0.001)	-0.016	(0.001)
Log of # of establishments					0.021	(0.001)			0.023	(0.001)	0.023	(0.001)
Internet											0.004	(0.002)
E-commerce											0.010	(0.002)
1998	0.008	(0.001)	0.006	(0.001)	0.007	(0.001)						
1999	0.011	(0.001)	0.008	(0.001)	0.009	(0.001)						
2000	0.021	(0.001)	0.014	(0.001)	0.012	(0.001)						
2001	0.025	(0.001)	0.016	(0.001)	0.015	(0.001)	0.018	(0.001)	0.008	(0.001)	0.005	(0.001)
2002	0.028	(0.001)	0.018	(0.001)	0.018	(0.001)	0.020	(0.001)	0.011	(0.001)	0.008	(0.001)
2003	0.027	(0.001)	0.020	(0.001)	0.018	(0.001)	0.020	(0.001)	0.012	(0.001)	0.008	(0.001)
2004	0.031	(0.001)	0.023	(0.001)	0.020	(0.001)	0.023	(0.001)	0.013	(0.001)	0.009	(0.002)
2005	0.030	(0.001)	0.022	(0.001)	0.019	(0.001)	0.022	(0.001)	0.013	(0.001)	0.008	(0.002)
2006	0.027	(0.001)	0.019	(0.001)	0.016	(0.001)	0.019	(0.001)	0.009	(0.001)	0.005	(0.002)
Intercept	0.097	(0.001)	0.038	(0.001)	0.050	(0.009)	0.105	(0.001)	0.107	(0.009)	0.113	(0.009)
Industry dummies	No		Yes		Yes		No		Yes		Yes	
NOBs	195,616		195,617		195,618		137,863		137,863		137,863	
R-squared	0.003		0.380		0.391		0.001		0.402		0.402	

Figure 1: Fraction of contingent employment

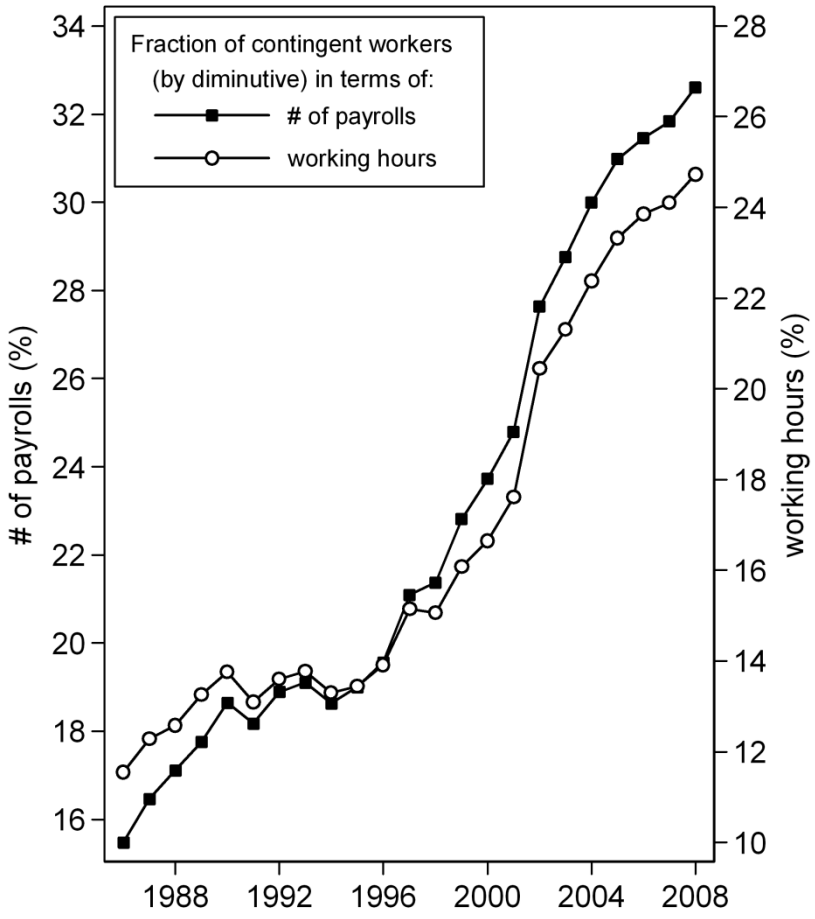
Panel A



Source: Monthly Labor Force Survey, 1986-2008.

Note: Sampling weights are used. Those in schools are excluded.

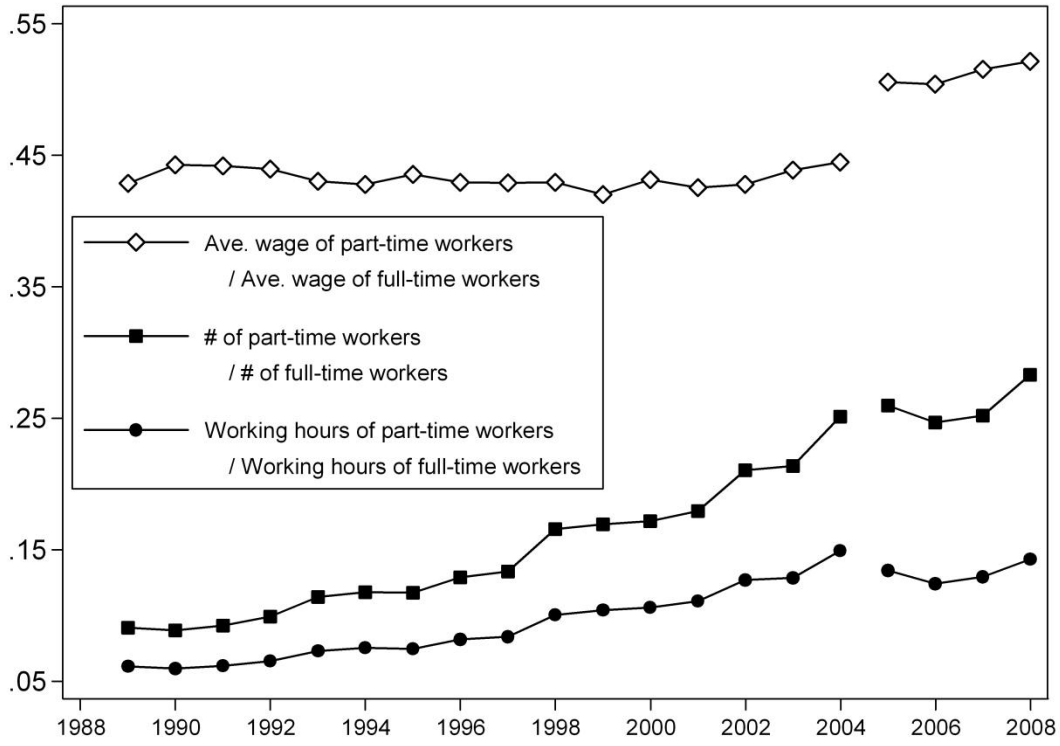
Panel B



Source: Monthly Labor Force Survey, 1986-2008.

Note: 'Contingent' workers include part-time workers, contract workers, and dispatched workers.

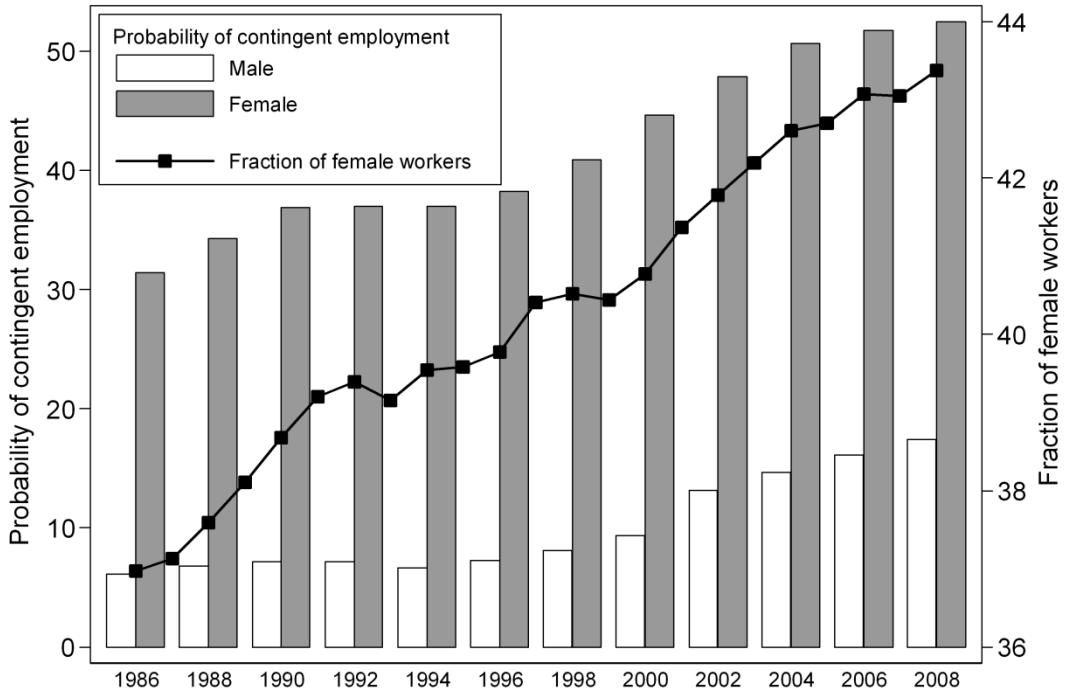
Figure 2: Relative Importance of Demand and Supply Shifts



Source: Basic Survey of Wage Structure, 1988-2008.

Note: Wage is calculated as hourly rate (monthly wage divided by total monthly hours of work). Wage includes bonus payment, and working hours are scheduled hours plus overtime hours. The correlation coefficient between the relative wage and the fraction of part-time workers is 0.71 (significant at the 1% level) and that between the relative wage and the relative working hours is 0.56 (significant at the 5% level).

Figure 3: Fraction of Female Workers and Probability of Part-Time Employment

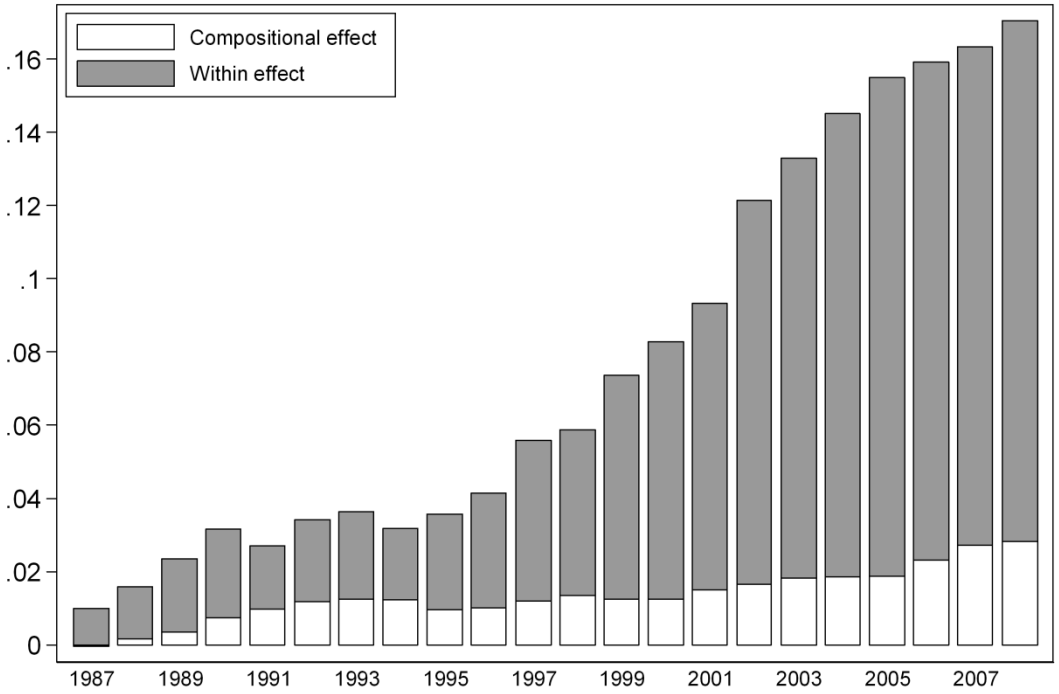


Source: Monthly Labor Force Survey, 1986-2008.

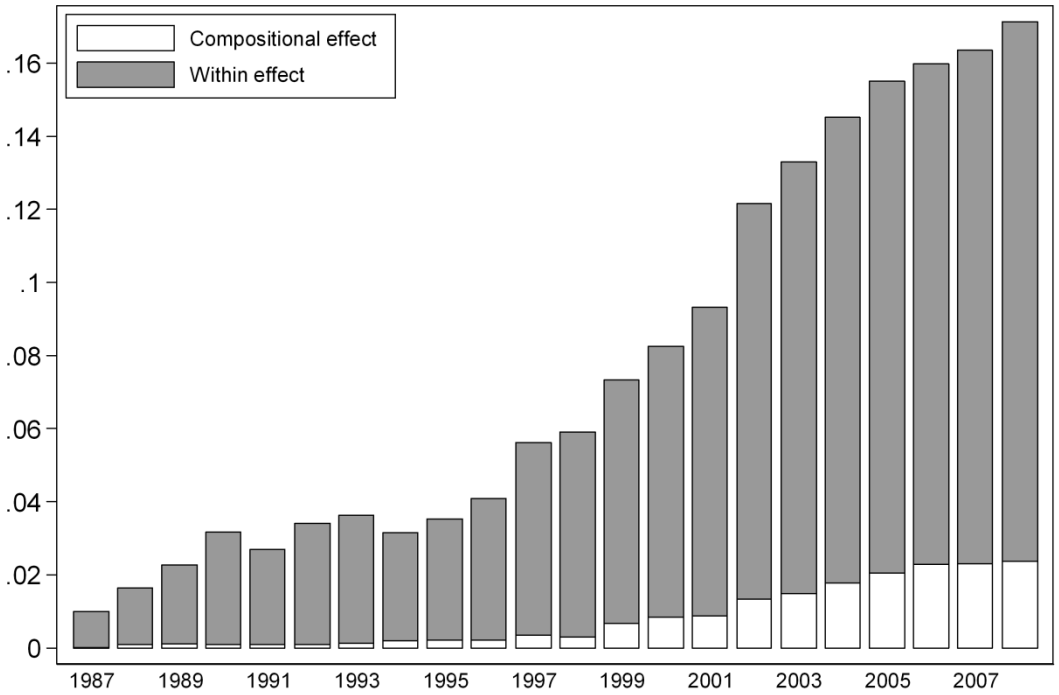
Note: Sampling weights are used.

Figure 4: Decomposition of Increases in Contingent Workers from 1986

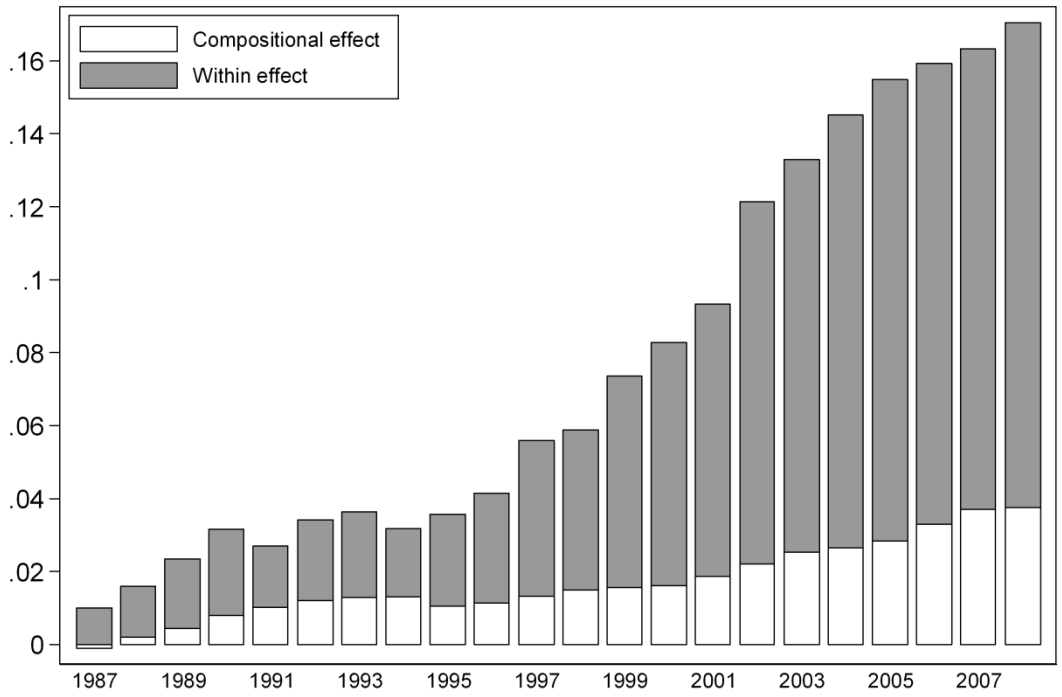
A) Demographic Characteristics



B) Industrial Composition



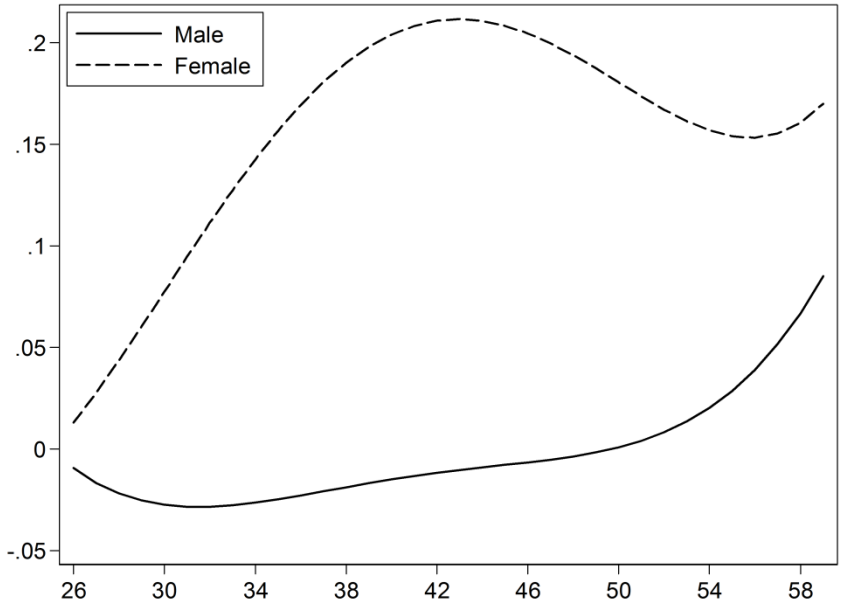
C) Demographic Characteristics and Industrial Composition



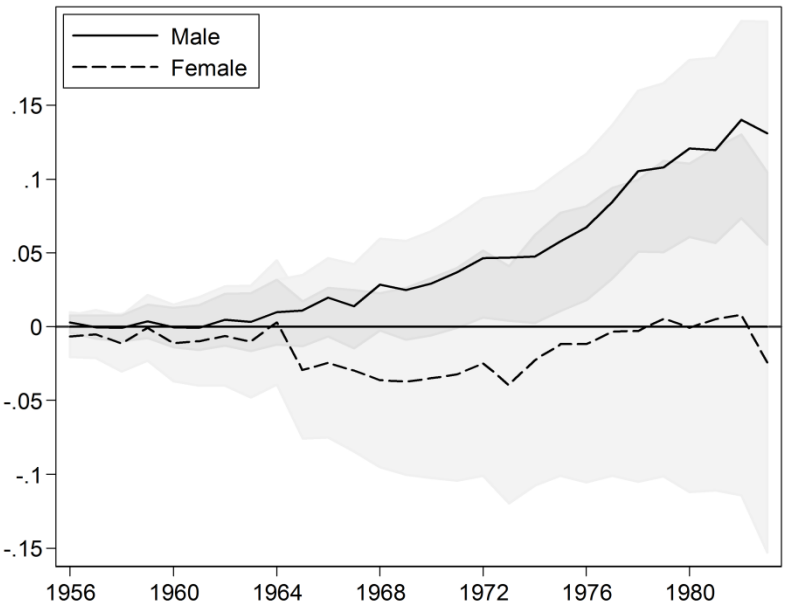
Source: Authors' calculation based on the results in Table 2 using Monthly Labor Force Survey, 1986-2008. The difference of the fraction of contingent workers in year t and 1986 is decomposed into compositional effect and within-industry effect using the equation: $\bar{x}_t\hat{\beta}_t - \bar{x}_{1986}\hat{\beta}_{1986} = (\bar{x}_t - \bar{x}_{1986})\widehat{\beta_t} + \bar{x}_{1986}(\hat{\beta}_t - \hat{\beta}_{1986})$.

Figure 5: Age, Birth Cohort, Year and the Fraction of Contingent Workers, 1986-2008, Ages 25-59

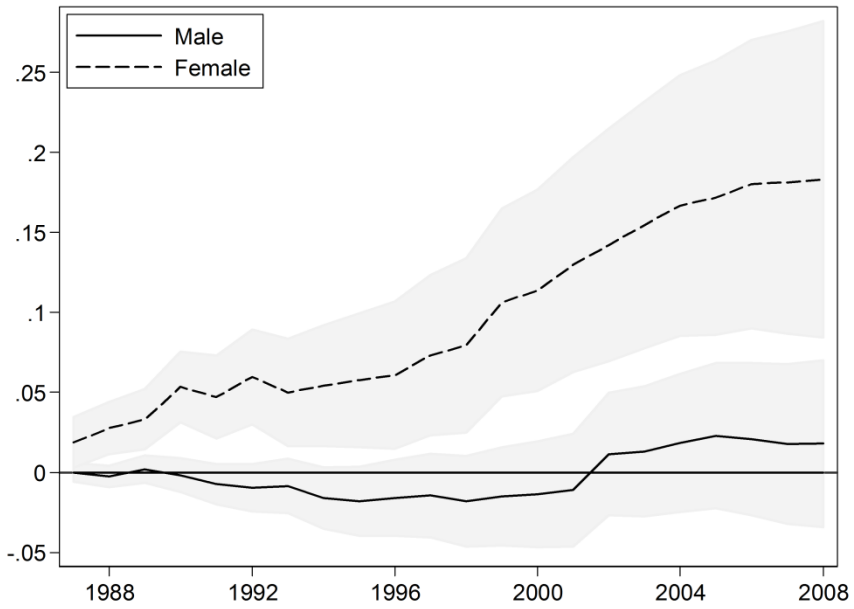
Panel A: The Effect of Age on Contingent Status, Quartic Function, Compared with 25 Years Old



Panel B: The Effects of Birth Cohort on Contingent Status, Compared with 1955 Cohort



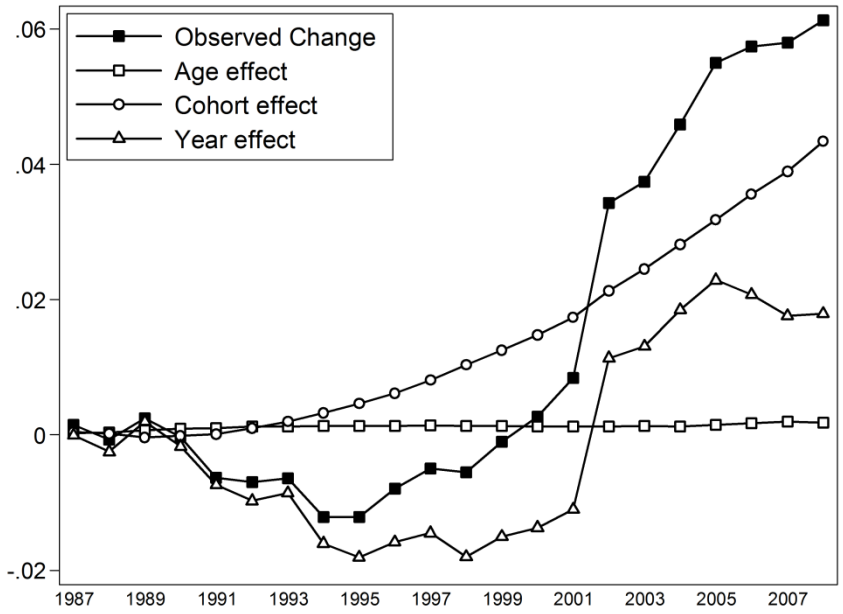
Panel C: The Effects of Year on Contingent Status, Compared with 1986



Note: The coefficients on birth cohort and year dummy variables estimated from the regression: $y_{it} = f(age_{it}) + \delta_c + \delta_t + X_{it}\beta + u_{it}$, are reported in Panels A and B. The continuous function $f(age_{it})$ is approximated by the quartic function. N=705,279 and R^2=0.041for male and N=503,439 and R^2=0.092 for female. The shaded areas are the 95% confidence intervals. The overlapped area in Panel B is darkly colored.

Figure 6: The Contributions of Age, Birth Cohort, Year on Increase of Contingent Workers, 1986-2008, Ages 25-59

Panel A: Male



Panel B: Female