

**Long-term effects of job displacement in Japan: A conservative estimate using the  
Japanese Longitudinal Survey on Employment and Fertility (LOSEF)**

by

Mayu FUJII,

Department of Economics, Hokkaido University of Education

and

Ryo KAMBAYASHI,

Institute of Economic Research, Hitotsubashi University

**Abstract**

Using data from the Japanese Longitudinal Survey on Employment and Fertility (LOSEF), we investigate the long-term effects of employment (or job) displacement on earnings in the Japanese labor market. Using a fixed-effects model, we find significant negative effects of displacement, amounting to 21.7% of monthly earnings. Further, we conclude that the earnings penalty is persistent, with the estimate of earnings losses remaining at 16.2% four years after displacement. Given that our sample includes those who experienced displacement only once in their career and were reemployed as a standard worker within a year, we consider that our estimates of the earnings reductions associated with job displacement are conservative.

# 1. Introduction

There has been a growing trend toward employment (or job) displacement in Japan since the 1990s. If we define job displacement as employment separation because of economic dismissal and transfer, the rate grew from about 1.1% in 1989 to 2.6 % in 2001, as reflected in the Employment Trend Survey (ETS) published by the Japanese Ministry of Health, Labour and Welfare. This increasing trend raises justifiable concerns about the costs of job displacement. In particular, these costs could be especially high in Japan, where internal labor markets play an essential role in the employment system, and where employees hired immediately upon graduation and in continuous employ at the same firm, frequently enjoy much stronger employment security than other workers.

The consequences of displacement have received significant attention in the context of the US labor market. In particular, using either data from the Panel Study of Income Dynamics (PSID) (Ruhm, 1991; Stevens, 1997) or administrative records (Jacobson et al., 1993; Couch and Placzek, 2010), the existing research literature shows that displaced workers suffer from significant earnings losses that persist for at least four to six years after displacement. In contrast, studies of displacement in the Japanese labor market have relied heavily on large cross-sectional data sets such as the ETS or Employment Status Survey (ESS) conducted by the Japanese Statistics Bureau (Abe et al., 2002; Bognanno and Kambayashi, 2013). For the most part, these studies find that there is a significant one-time wage penalty associated with displacement. Moreover, by exploiting the large sample size of the ETS, they show that the wage penalty varies by worker characteristics such as age and tenure. However, because of a lack of panel data, the long-term effects of displacement in the Japanese labor market remain largely unknown.

The objective of this study is to supplement the findings in existing studies with an investigation into whether displaced workers experience long-term earnings losses in the Japanese labor market. Specifically, using panel data from a series of the Japanese Longitudinal Survey on Employment and Fertility (LOSEF) that has recently become available, we explore the magnitude and persistency of earnings losses associated with job displacements in Japan.

The remainder of the paper is organized as follows. Section 2 presents a statistical model describing the relationship between earnings and displacement and explains our estimation method. Section 3 describes the data used for the empirical analysis. Section 4 presents the results and Section 5 concludes.

## 2. Analytical framework

To examine the long-term effects of job displacement on monthly wages, we apply the method of Jacobson et al. (1993). More specifically, we first estimate the following wage equation:

$$y_{it} = \alpha_i + \gamma_t + X_{it}\beta_x + \sum_{k=-3}^4 \delta_k D_{it}^k + \varepsilon_{it} \quad (1)$$

where  $y_{it}$  is the natural log of earnings and  $X_{it}$  is a set of time-variant variables that influence both monthly compensation and employment probabilities, such as age and age squared.  $D_{it}^k$  is a dummy variable that takes a value of 1 if individual  $i$  was displaced  $k$  years prior to time  $t$ . In this study, based on an international comparison conducted by the OECD,  $k$  takes values from  $-3$  to  $4$ : we assume that earnings reductions begin three years prior to displacement and continue for four years after the displacement (OECD, 2013).

Lastly,  $\gamma_t$  is a set of year dummy variables we use to control for the effects of the nationwide economy. The variable  $\alpha_i$  represents individual fixed effects (FE), that is, a set of time-invariant unobserved individual characteristics that effect monthly compensation. If  $\alpha_i$  includes factors such as the worker's ability and motivation that would affect both monthly compensation and the probability of displacement, then estimating Equation (1) without controlling for  $\alpha_i$  would yield biased estimates of the effects of displacement. To deal with this issue, we employ a FE model in estimating Equation (1).

### **3. Data**

#### *3.1. Data source*

The data used in this study are from four waves of Internet surveys administered by the Project on Intergenerational Equity at the Research Institute for Policies on Pension and Aging: (1) the LOSEF: the 2011 Internet Version, (2) the LOSEF for the middle-aged and elderly, (3) the LOSEF for the youth, and (4) the LOSEF for displaced workers<sup>1</sup>. Survey (1) was conducted in Sep.–Dec. 2011, Survey (2) in Nov.–Dec. 2012, and Surveys (3) and (4) in Nov.–Dec. 2013. Hereafter, we collectively refer to Surveys (1)–(4) as the LOSEF.

The LOSEF collected longitudinal data on individuals' public pension enrollment, employment, and other major life events (e.g., marriage, childbirth). The respondents for the surveys were selected from those registering as monitors with an Internet survey company. Survey (1) covered approximately 6,000 males and females aged 30 to 59 years in the survey

---

<sup>1</sup> See Takayama et al. (2012) for a detailed explanation of the LOSEF, including the 2011 Internet version, and Takayama et al. (2013) for the LOSEF for the middle-aged and elderly.

year. Surveys (2)–(4) supplemented Survey (1) with information on the middle-aged and elderly, youth, and displaced workers, respectively. In particular, Survey (2) covered approximately 2,000 males and females aged 50 to 69 years, and Survey (3) about 3,000 males and females aged 21 to 35 years. Survey (4) targeted individuals who had experienced displacement, where an individual was identified as displaced if he/she answered “yes” to both of the two screening questions as follows. “Have you ever worked as a standard employee (*seishain*)?” and “Have you ever left employment due to bankruptcy, layoff, voluntary redundancy, or ordinal dismissal at least once in your career after March 31, 2011?” As many as 1,400 displaced workers participated in Survey (4), providing a valuable and useful data source for the study of displaced workers in Japan. We construct our dataset by pooling information on the sample of LOSEF, leading to a total sample of 11,962 individuals comprising 298,512 person-year observations.

The unique characteristic of the LOSEF was that it asked respondents to utilize their Social Security Statement (*Nenkin Teikibin/Nenkin Net*) in responding to questions in the survey. In Japan, a Social Security Statement is an administrative document issued to enrollees in one of two public pension schemes: a scheme for workers regularly employed in private establishments (Employees’ Pension, hereafter Pension-E, *Kosei Nenkin Hoken*) and a scheme for the self-employed, farmers, nonstandard workers, and other nonemployed (National Pension, hereafter Pension-N, *Kokumin Nenkin*)<sup>2</sup>. The aim of issuing the Social Security Statement is to inform the public pension enrollees of their enrollment history. As such, the document contains individual monthly records on the schemes in which a worker is enrolled, contributions made,

---

<sup>2</sup> Although nonstandard workers are qualified for the scheme if they are a regularly employed worker based on the overall assessment of work arrangements and content of the work (Japan Pension Service, <http://www.nenkin.go.jp/n/www/english/detail.jsp?id=39>), for simplicity we refer to workers enrolling in Pension-E as “standard workers.” The document is not issued to enrollees in the public pension schemes for civil servants (Mutual Aid Associations, *Kyosai Nenkin*). Hence, Surveys (1)–(4) do not include these individuals.

etc., from age 15 years (or age 20 years for those enrolled in Pension-N) to the present. Given that an individual must enroll in/disenroll from Pension-E each time he/she obtains/separates from a standard job, we can identify the number of job acquisitions/separations from the Pension-E enrollment record. In addition, information on the name of the firm where the worker was employed and the amount of standard monthly compensation (*Hyojun Hoshuu Getsugaku*) received, etc., is available for each period he/she participated in Pension-E<sup>3</sup>.

The LOSEF asked respondents to provide accurate information for the Social Security Statement by transcribing the administrative document. Furthermore, it required respondents to answer retrospective questions about the characteristics of the Pension-E-covered jobs that formed the basis of the records in the Social Security Statement. The LOSEF also asked respondents who had experienced Pension-E-covered job separation to recall and select the reason for each such experience from one of seven alternatives. These are (i) bankruptcy, layoff, voluntary redundancy, (ii) mandatory retirement or transfer to an affiliated company (include being reemployed as a trusted employee), (iii) ordinary dismissal, (iv) termination of contract period (includes seasonal work), (v) marriage, childbirth, child raising, (vi) caregiving for elderly parents, and (vii) other.

Given the information available in the LOSEF, we specify the natural log of the standard monthly compensation as of April each year as the dependent variable. The main independent variables are dummy variables representing the timing of displacement. We define displacement as the situation where an individual leaves employment because of bankruptcy, layoff,

---

<sup>3</sup> The Pension-E scheme classifies standard monthly compensation, corresponding to monthly compensation in our analysis, into 30 ranks according to the prescribed table. This serves as the basis for calculating the benefits and contributions of the Pension-E scheme. Compensation includes salary, wages, and any allowances employees receive from their employer, but does not include extra allowances or bonuses received at intervals of more than three months (Japan Pension Service, retrieved from <http://www.nenkin.go.jp/n/www/english/detail.jsp?id=39>).

voluntary redundancy, or ordinal dismissal. We identify the timing of displacement from the dates that the respondent disenrolled from Pension-E.

The constructed data have three major advantages over ETS and ESS used in existing studies. First, as described above, the LOSEF contains the detailed longitudinal information on individual employment that is necessary to investigate the long-term effects of displacement on earnings. Second, because they draw on the respondents' Social Security Statement, we expect the data to have few recall biases and problems with attrition. Finally, because of Survey (4), the sample of the data contains a relatively large number of displaced workers, which is essential for the current analysis.

Despite the abovementioned advantages, the data also have three potential shortcomings. First, the sample of the LOSEF is not nationally representative (Takayama et al., 2012, 2013). Second, in the LOSEF data, we cannot observe detailed characteristics of an individual's position (including standard monthly compensation) during the periods he/she had not enrolled in Pension-E. Hence, the sample used in our analysis biases toward those who are regularly employed in private establishments<sup>4</sup>.

However, we must also point out that given the nature of the Japanese labor market, these restrictions will actually lead to more relevant as well as more conservative estimates of the displacement penalty. In every economy, the primary target for the examination of the displacement penalty is displacement from a 'good job' because we naturally assume a liquid labor market for job changers changing from 'bad jobs' (Kalleberg, 2011). In addition, the data will maintain the longitudinal employment records that had succeeded in a better transition after displacement. Therefore, the analysis in this study places more importance on internal validity

---

<sup>4</sup> Note that nonstandard workers will be qualified for the scheme if considered a standardly employed worker based on the overall assessment of work arrangements and the content of the work (Japan Pension Service, <http://www.nenkin.go.jp/n/www/english/detail.jsp?id=39>).

in making the conservative estimates of the displacement loss, rather than on the nationwide average level. The final shortcoming is that the only available measure of earnings in the LOSEF, standard monthly compensation, does not include extra allowances or bonuses received at intervals of more than three months. In addition, it is a categorical measure. Hence, the problem of measurement error may arise.

### 3.2. Sample restrictions

To obtain the most conservative estimates of the displacement penalty, we impose several restrictions on our sample, as shown in Table 1.

**Table 1: Sample restrictions**

	Number of individuals (Number of person- year observations)
Enrolled in the Pension-E	10,651 (239,284)
1. Separated just once	3,311 (74,955)
A. Involuntary (=bankruptcy, layoff, voluntary redundancy, or ordinary dismissal)	461 (12,207)
(a) At least 3 years of tenure when displaced	386 (11,235)
(b) Worked as a standard worker in the first Pension-E covered job	355 (10,444)
(c) Found the next Pension-E-covered job within a year after the displacement	109 (2,913)
(d) Worked as a standard worker in the second Pension-E covered job	86 (2,215)
2. Never separated	1,586 (25,869)
(a) At least 3 years of tenure	1,392 (25,448)
(b) Worked as a standard worker	1,317 (24,449)

*Note: The original sample consists of 11,962 individuals with 362,773 person-year observations*

First, our sample is limited to individuals who have had a Pension-E-covered job (i.e., been enrolled in Pension-E) at least once in their career. For each of these individuals, the sample period starts from the year he/she first obtained a Pension-E-covered job and ends the year of



the survey in which they participated<sup>5</sup>. This restriction reduces the number of individuals to 10,651 (89% of the original sample) and the number of person-year observations to 239,284 (80.2% of the original sample). Hereafter, we refer to this sample as the Pension-E sample.

In imposing further sample restrictions, we divide the individuals in the Pension-E sample into two groups: individuals who had separated from a Pension-E-covered job and those who had never had such an experience. The treatment group is constructed by additionally placing restrictions on the individuals in the former group so that it only contains those who were displaced and would be least affected by displacement (i.e., treatment). These include those who separated from a Pension-E-covered job just once by the survey date and those whose reason for job separation was displacement (i.e., bankruptcy, layoff, voluntary redundancy, or ordinary dismissal). It also includes those who had at least three years of tenure when displaced, those who found the next Pension-E-covered job within a year after the displacement, and those who had worked as a standard worker (*seishain*)<sup>6</sup>. After examining the wage penalty for displacement using this restricted sample, we check the robustness of the results by relaxing the sample restrictions. On the other hand, the individuals who had never separated from a Pension-E-covered job are included in our control group only if they had continuously worked on the single Pension-E-covered job for at least three years by the survey date as a standard worker.

The final sample satisfying all explanatory variables in addition to these constraints comprises 1,403 individuals (11.7% of the original sample) with 24,339 person-year observations (10.2% of the original sample). The average number of observations per individual

---

<sup>5</sup> The average age at which these individuals first enrolled in the Pension-E was 22.2 years.

<sup>6</sup> Note that nonstandard workers are qualified for the scheme if considered to be a standardly employed worker based on the overall assessment of work arrangements and content of the work (Japan Pension Service, <http://www.nenkin.go.jp/n/www/english/detail.jsp?id=39>).

is approximately 17.3. Table A1 in the Appendix provides summary statistics of the variables representing the characteristics of the final sample. Compared with those in the Pension-E or original samples, the individuals in the final sample were less likely to be aged 60 years or older at the time of the survey, less likely to be female, and more likely to have a higher education.

### *3.3. Characteristics of the final sample*

The final sample is composed of 86 displaced workers and 1,317 nondisplaced workers. Although the sample size of displaced workers in this study is small, small sample size has always frustrated previous studies because the job displacement phenomenon is uncommon in labor markets. For example, the PSID dataset that Stevens (1997) used includes only 258 single displaced workers<sup>7</sup>. Given the lower frequency of displacement in Japan (an average annual rate of 1.2% vs. 5.0% in the US over 2000–08 according to the OECD (2013) Figure 1), the sample size in this study is within reasonable bounds. Compared with the nondisplaced workers in the final sample, the displaced workers are much more likely to be aged 50 years or older at the time of the survey and less likely to have a higher education, as shown in Table 2.

**Table 2: Sample characteristics by displacement experience**

---

<sup>7</sup> Stevens (1997, Table 2).

	Displaced		Nondisplaced	
	Mean	S.d.	Mean	S.d.
<i>Demographic characteristics</i>				
Age	46.69	10.25	39.67	10.24
20s	0.035		0.152	
30s	0.244		0.427	
40s	0.279		0.210	
50s	0.337		0.186	
More than 60	0.105		0.024	
Female	0.174		0.235	
University education or higher	0.581		0.727	
<i>Characteristics of the first Pension-E covered job</i>				
Age first obtained the Pension-E-covered job	22.30	2.77	23.12	2.95
Years of tenure at the first Pension-E-covered job	17.49	10.52	16.560	10.333
Industry:				
Agriculture, forestry, and fishery	0.000		0.003	
Construction	0.093		0.058	
Manufacturing	0.267		0.367	
Information and communications	0.140		0.103	
Transportation or delivery activities	0.023		0.031	
Wholesale and retail trade	0.163		0.098	
Finance and insurance	0.105		0.107	
Real estate	0.012		0.011	
Scientific research	0.000		0.004	
Accommodation, food, and beverage services	0.000		0.005	
Amusement and leisure	0.012		0.002	
Education	0.012		0.011	
Healthcare and welfare	0.023		0.060	
Other	0.151		0.140	
Occupation:				
Professional/technical	0.372		0.412	
Management	0.151		0.073	
Office work	0.233		0.292	
Sales work	0.140		0.094	
Services work	0.035		0.049	
Security work	0.012		0.002	
Transport/communication	0.012		0.012	
Production/manufacturing/field work	0.047		0.056	
Unknown	0.000		0.010	
Firm size:				
Less than 100	0.302		0.200	
100 to 299	0.221		0.112	
300 to 499	0.081		0.062	
500 to 999	0.058		0.111	
1000 or more	0.337		0.516	
Number of obs.		86		1317

*Note: Standard deviations for dummy variable are not shown.*

For example, in 2010, the share of those over 50 among displaced workers was 37.3% according to ETS, which is apparently smaller than the 44.2% shown in Table 2. In addition, the share of females was 37.3% in the ETS while it is only 17.4% in the LOSEF displaced sample. Given the demographics of the LOSEF sample itself, it is not totally without some bias toward older and/or male workers<sup>8</sup>; this is partly because our restriction excludes ‘job-hopping workers’

<sup>8</sup> The comparison between the LOSEF and other notionally representative statistics are from Takayama et al. (2012, 2013).

who repeatedly separate from employment. Actually, workers experiencing a displacement when young are more likely to experience displacement during their working lifetime.

Furthermore, in terms of the initial Pension-E-covered job, the displaced workers were more likely to work in the construction, wholesale and retail trade, or amusement and leisure industry, more likely to be managers or security workers, and more likely to work at small firms. These characteristics are in accord with the cross-sectional statistics from the ETS, e.g., the shares of displaced workers in the construction, manufacturing, and retail/wholesale industries in 2010 were 7.4%, 21.9%, and 16.1%, respectively.

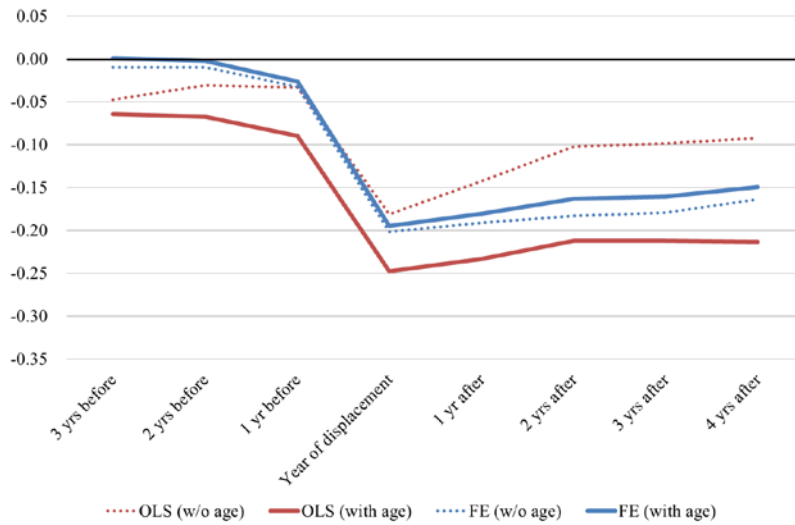
Among the displaced workers in the final sample, the average age in the year of displacement was about 39 years, with minimum and maximum ages of 22 and 59 years, respectively (see Table A2 in the Appendix). On average, displaced workers spent 0.27 years finding the next Pension-E-covered job following displacement, and accumulated 6.9 years of tenure on the job following reemployment. Further, 59% moved to smaller firms, 49% changed industry, and 37% changed occupation.

## **4. Basic results**

### *4.1. Long-term earnings effects of displacement*

Figure 1 plots the estimated coefficients in Equation (1). Table 3 in the Appendix provides the values of the estimated coefficients and their standard errors.

**Figure 1: Earnings effects of displacement**



Source: LOSEF. Estimated results are in Table A3 in the Appendix. The earnings losses are calculated as  $e^{\hat{\delta}_k} - 1$ .

In Figure 2, the dotted red line depicts the OLS estimates of Equation (1) when we do not control for the effects of age. All of the estimated coefficients on the after-displacement dummies are negative and statistically significant, which reveals that the average earnings of displaced workers are less than those of continuing workers after displacement occurs. In addition, the average difference in earnings is largest immediately after displacement. More specifically, on average, displaced workers’ earnings fall by about 20% in the year of displacement, but tend to recover a few years later. Figure 1 also plots the results of the OLS estimates of Equation (1) when we add the age and age squared variables as covariates (the solid red line) and the FE estimates without and with the age and age squared control variables (dotted blue and solid blue lines, respectively). Regardless of the change in the specification and estimation method, the relative decline in earnings at displacement remains robust, although the magnitude of the effect ranges from 18.1% to 24.8%<sup>9</sup>.

<sup>9</sup> The percentage is computed as  $e^{\hat{\delta}_k} - 1$ .

For the most part, the estimated reductions in earnings from displacement are larger than those reported in previous research such as that of Abe et al. (2002) or Bognanno and Kambayashi (2013). The difference arises mainly for two reasons. First, extant studies have estimated the earnings effects of job separation (including voluntary quits) rather than displacement. Second, their samples include both standard and nonstandard workers. Indeed, when focusing on the earnings effects of displacement among middle-aged standard workers, Bognanno and Delgado (2008) report a job loss penalty of 28.5%, which is comparable to the results of the present analysis. Besides, according to the OECD (2013), earnings losses of 20% to 30% in the year of displacement are evident in European countries such as Germany, Portugal, and Great Britain<sup>10</sup>. Thus, the cross-sectional data that the previous literature is largely based on may have underreported the displacement penalty.

More importantly, regardless of specification and the estimation method, displacement has long-lasting effects on earnings. That is, earnings fall by 9.2% to 21.3% among displaced workers compared with continuing workers, even up to four years after displacement. As we focus on workers displaced only once and reemployed as a standard worker within a year of displacement, our estimates of the displacement penalty should be rather conservative. Hence, the results imply that even those who were expected to be least affected by displacement suffer from a long-term earnings reduction after the event. This observation is consistent with past studies pointing out the importance of firm-specific human capital in the Japanese labor market (e.g., Hashimoto and Raisian, 1985).

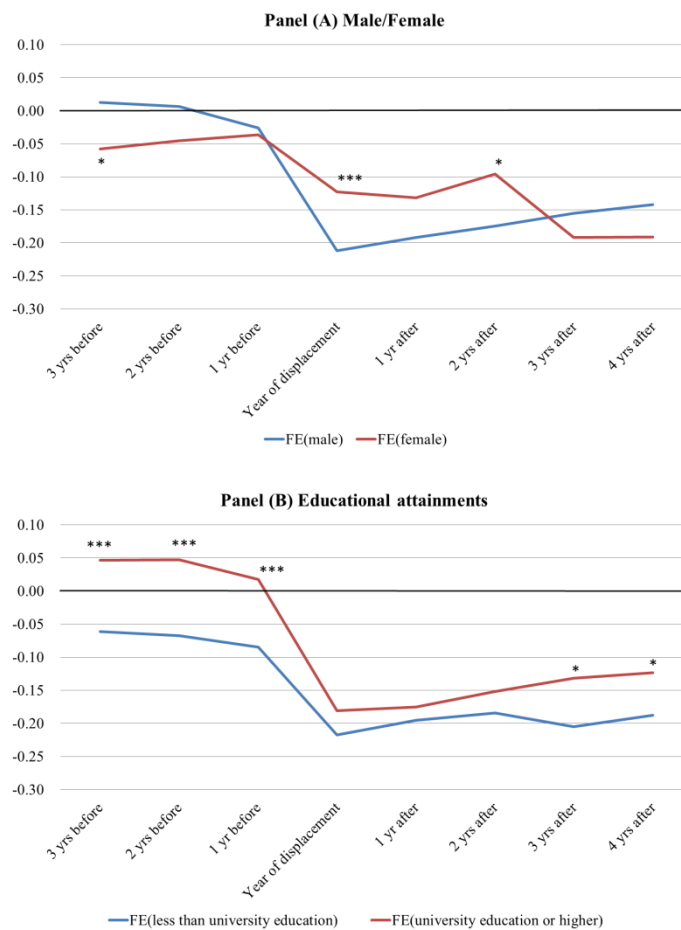
#### *4.2. Subsample analysis*

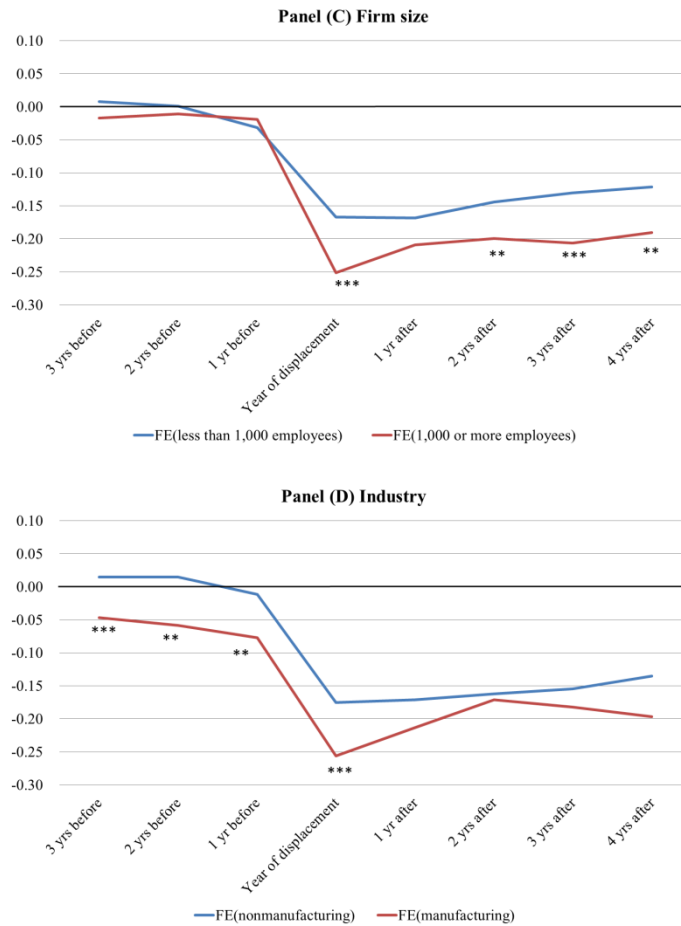
---

<sup>10</sup> OECD (2013) Figure 10, p. 26.

If the displacement penalty relates to the labor market structure, such as the mode of human capital accumulation, it may also depend on worker characteristics. To examine whether the earnings effects of displacement vary by worker characteristics, we interact each displacement dummy variable  $D_{it}^k$  with variables indicating each worker's sex and education and employing firm size and industry, and reestimate Equation (1) including these interaction terms. Figure 2 provides FE estimates of the model, with the values of the estimated coefficients and their standard errors detailed in Table A4 in the Appendix.

**Figure 2: Earnings effects of displacement by subsample**





Source: LOSEF. Estimated results are in Table A4 in the Appendix. The earnings losses are calculated as  $e^{\delta_k} - 1$ . \*, \*\*, and \*\*\* indicate that the difference between the two groups is statistically significant at the 15%, 10%, and 5% level, respectively.

The first set of results in Panel A shows how the earnings effects of displacement vary by sex. Some of the FE estimates of the coefficients on the interaction terms between displacement dummies and the female dummy are positive and significant, while others are not. These results appear to indicate that displacement affects female workers less than male workers. However, some caution is required in interpreting the results given the extremely small sample size of displaced female workers (just 15 of the 86 total displaced workers).

The second set of results in Panel B depict the earnings losses of displaced workers by the level of education (less than university education/university education or higher). All of the FE



estimates of the coefficients on the interaction terms between the displacement dummy and the high education dummy are positive. This suggests that the earnings losses associated with displacement tend to be smaller for highly educated workers. Furthermore, the difference between lower and higher educated workers is not significant at the time of reemployment, but does become significant in the third year after reemployment. This would be the case if, in a few years after reemployment, highly educated workers were more likely assessed to be or it is “learned” by the next employer that they are deserving of higher earnings. For example, based on an ad hoc survey of employers, Nakamura and Ohashi (2002) report that wage increases for standard workers hired mid-career are likely to be faster than that of incumbents because of the employer’s screening or learning stage at the beginning of the second employment spell.

The third set of results in Panel C illustrates the difference in the earnings penalty of displacement by firm size (fewer than 1,000 employees/1,000 employees or more). All of the FE estimates of the coefficients on the interaction terms between the displacement dummies and the large firm dummy are negative and mostly significant. Hence, workers displaced from a large firm tend to experience larger earnings reductions when compared with those displaced from a small firm. Moreover, the difference seems to persist over time. This result reflects the fact that wages are generally higher in larger firms and that about 60% of the displaced workers from a large firm find reemployment in a smaller firm (Table A2 in the Appendix). As we do not control for firm size after displacement in the estimation model, the wage loss of being displaced from larger firms tends to persist over time<sup>11</sup>.

The final set of results in Panel D show how the earnings effects of displacement vary by industry. All of the FE estimates of the coefficients for the interaction terms between the

---

<sup>11</sup> While such an observation would be consistent if workers in a large firm had greater opportunities to receive training that produces specific human capital, the literature does not reveal whether the wage differential arising from firm size is based on the specificity of human capital.

displacement dummies and a manufacturing sector dummy are negative but mostly insignificant. The absolute values of the coefficients appear to indicate that the earnings losses of workers displaced from the manufacturing sector are larger than for workers displaced from the other sectors, although the difference disappears over time.

In general, the subsample analysis is consistent with the importance of specific human capital. Since seminal work by Hashimoto and Raisian (1985), work on Japanese labor markets has emphasized the role of specific human capital, especially for a particular group in the economy, namely, highly educated male standard workers in the manufacturing industry.

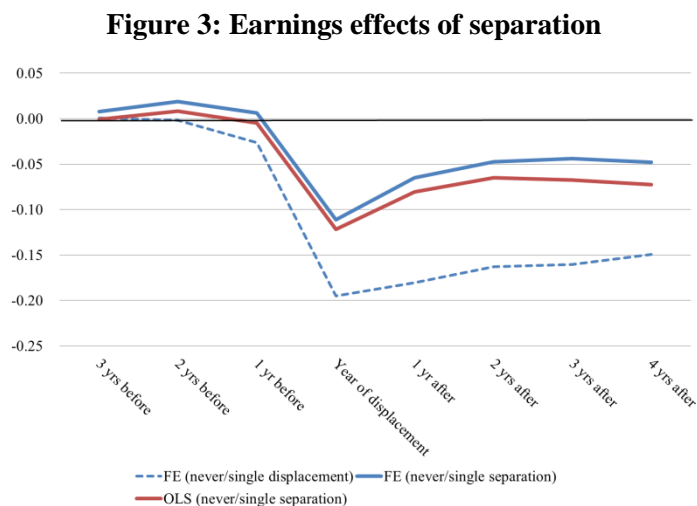
## **5. Relaxing the sample restriction**

As explained in the previous section, we first restricted the sample to obtain a conservative estimate of the earnings penalty from displacement and found that the penalty was not negligible in size and continued for at least four years following displacement. In this section, we relax each of the sample constraints in turn and check the robustness of our interpretation presented in the previous section.

### *5.1. Voluntarily separated workers*

We first include voluntarily separated workers in our sample and reestimate Equation (1). Figure 3 depicts the estimated results with the values of the estimated coefficients and their standard errors in Table A5 in the Appendix. For comparison, we represent as a dotted blue line the FE estimates of Equation (1) with age variables from Figure 1 (the results obtained where we excluded voluntarily separated workers from our sample). Given that the voluntarily

separated workers separated from a firm for reasons other than displacement, the analysis in this subsection essentially identifies the wage differentials between separated workers and incumbents.



Source: The LOSEF. Estimated results in Table A5 in the Appendix. The earnings losses are calculated as  $e^{\delta_k} - 1$ .

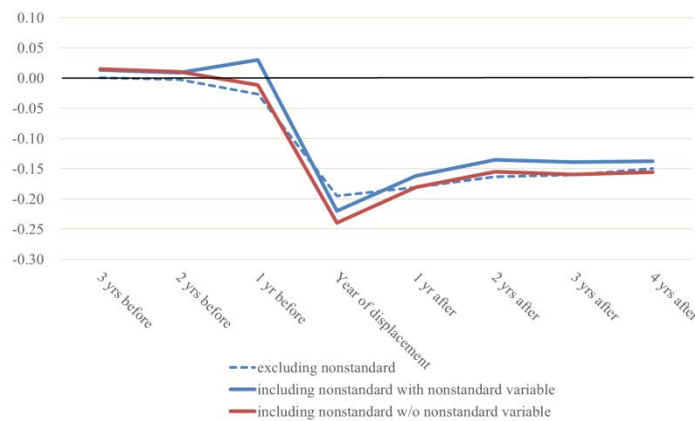
As expected, the average earnings loss from separation is smaller, reflecting the fact that workers usually quit when they obtain better wage offers elsewhere. Interestingly, however, we still observe a sharp decline in earnings in the year of separation by some 11.1–12.1%. This result is consistent with a finding in the existing literature that a one-time average wage change triggered by job separation is negative, even for workers separating voluntarily from their employer. Nakamura and Ohashi (2008) explain this phenomenon by the necessity of a learning process for new employers<sup>12</sup>.

<sup>12</sup> Figure 2 in the Appendix shows the earnings transition between continuing and separated workers who quit their job. While the earnings losses of voluntarily separated workers are less, the fall in the year of separation is significant and negative (about –10%).

## 5.2. Nonstandard workers

We now include nonstandard workers in our sample while maintaining the other sample restrictions. Figure 4 plots the estimated results with the detailed results in Table A6 in the Appendix. The solid red line shows the FE estimates obtained without controlling for a dummy variable indicating that the worker is a nonstandard worker, while the solid blue line shows the FE estimates with this control variable. For the purpose of comparison, we represent the FE estimates obtained in the main analysis as a dotted blue line.

**Figure 4: Earnings effects of displacement for standard/nonstandard workers**



Source: The LOSEF. Estimated results are in Table A6 in the Appendix. The earnings losses are calculated as  $e^{\delta_k} - 1$ .

Unlike the analysis in the previous subsection, the inclusion of nonstandard workers does not significantly increase the sample size<sup>13</sup>. This is because only workers regarded as a standard worker are qualified to participate in Pension-E. See footnote 6 for details. As a result, the estimated earnings penalty of displacement does not change much, even when we add nonstandard workers to our sample.

<sup>13</sup> While including voluntarily separated workers leads to an increase in the sample size by around 30%, adding nonstandard workers increases it by only 7%.

### 5.3. Long-term penalty

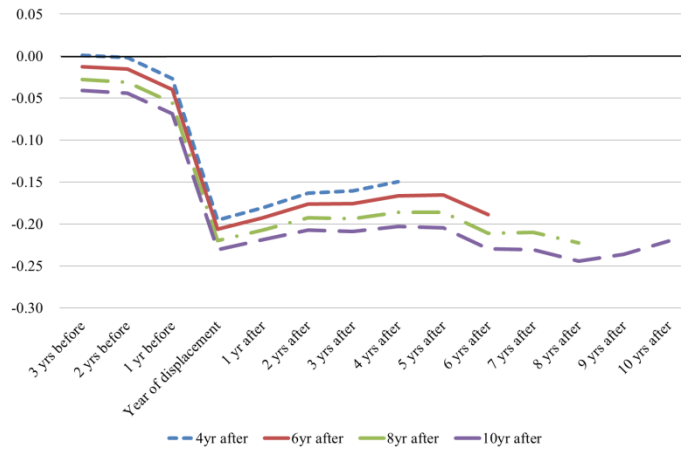
We next attempt to measure earnings losses of displaced workers for a period longer than four years after displacement. While we assumed that the effects of displacement last only for four years after displacement, mainly to contribute to an international comparison led by OECD (2013), there is no appropriate reason for making this assumption if we do not face restrictions on the availability of data.

If, in fact, the earnings penalty of displacement continues for more than four years, our basic analysis could bias the results. Assume that earnings losses continue for more than four years after displacement. Then, the average earnings level of displaced workers in the fifth year, for example, should be lower than that of continuing workers of the same age in the same year. If we specify the earnings equation as in Equation (1), we use the information on the earnings of displaced workers measured five years after displacement as if it is the information on earnings of the control group of a particular aged worker in a particular year. Hence, we will underestimate the earnings of the control group when in fact the earnings effects of displacement persist for more than four years. Thus, we could expect that adding a dummy variable representing the fifth year after displacement to Equation (1) would widen any difference in earnings between the treatment and control groups. To examine if this is the case, we estimate a model that assumes that earnings effects of displacement can last as long as 10 years. Figure 5 depicts the FE estimates of the earnings losses when we allow our model to include the persistence of displacement effects over six, eight, and 10 years. Table A7 in the Appendix includes the detailed results<sup>14</sup>.

---

<sup>14</sup> We also estimated models that allow the effects of displacement to persist for five, seven, and nine years (see Table A7 in the Appendix).

**Figure 5: Long-term earnings effects of displacement**



Source: The LOSEF. Estimated results are in Table A7 in the Appendix. The earnings losses are calculated as  $e^{\delta_k} - 1$ .

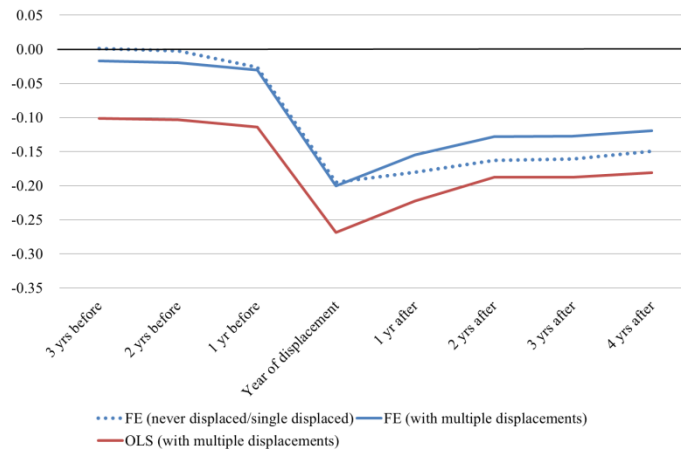
As expected, when we estimate models that consider the longer-term effects of displacement, the results show that the earnings of displaced workers decline more dramatically. Therefore, earnings losses associated with displacement persist for at least four years.

#### 5.4. Workers experiencing multiple displacements

Knowing exactly how to treat multiple displacements has always been problematic in the previous literature. The difficulty arises because a worker tends to experience displacement multiple times within a short period of time, and it is ambiguous whether we should classify, for example, the aftermath of the first displacement as the period after the (first) displacement or as the period before the (second) displacement. In this subsection, we follow Jacobson et al. (1985) and classify the period between one event of displacement and the next as both the period before the next event and the period after the previous event. More specifically, if an individual has experienced displacement multiple times, we assume that each of the events is independent, replicate the individual's record as many times as the number of his/her events of displacement,

and treat each of the replicated records as if it represents an individual experiencing a single displacement (for each of the multiple displacement events). We then estimate Equation (1) using the sample including the replicated records. Figure 6 graphically summarizes the estimated results with the details included in Table A8-1 in the Appendix.

**Figure 6: Earnings effects of displacement for multiply displaced workers**



Source: The LOSEF. Estimated results are in Table A8-1 in the Appendix. The earning losses are calculated as  $e^{\delta_k} - 1$ .

The results show that while the estimated earnings decline in the year of displacement is similar to that in our basic analysis, the recovery of earnings after reemployment tends to be faster (comparing the solid and dotted blue lines) for multiple displacements. In contrast, the earnings of workers who have experienced a single displacement event recover by 4.5% (=19.5%–15.0%) by the fourth year after displacement; the corresponding value is 8.2% (=20.1%–11.9%) when we include workers who have experienced multiple displacements in our sample. To confirm that this result is not a simple representation of any differences in unobserved characteristics between workers who have experienced single and multiple displacements, we reestimate the model using only information on the first displacement of each individual in the treatment group. As shown in Table A8-2 in the Appendix, the earnings

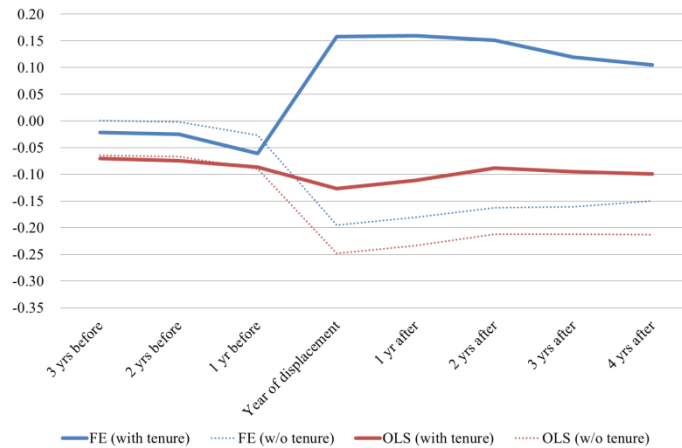
recovery following displacement for workers experiencing a single displacement event is not significantly different that after the *first* displacement for all displaced workers. Hence, the difference in the trajectories of earnings recovery presented by the solid blue and dotted blue lines in Figure 6 are the result of displacement experienced by a worker for a second or more time. To sum up, relaxing the sample restrictions does not change our main result that monthly earnings decline with displacement and do not recover quickly, with the effects persisting to at least four years following reemployment.

## **6. Discussion of tenure variables**

An additional issue is whether to control for the effects of tenure in Equation (1). Previous studies have generally avoided including both age and tenure variables as covariates in estimating the earnings losses associated with displacement, suspecting a problem with collinearity. However, controlling for the effects of tenure may allow us to understand better why displacement results in earnings losses. In particular, as we expect tenure to represent the amount of firm-specific human capital, controlling for its effect could reveal to what extent the earnings effects of displacement are from the loss of firm-specific human capital. In this section, we estimate the earnings penalty of displacement while controlling for the effects of both age and tenure. Figure 7 presents the results of the estimation.

**Figure 7: Earnings effects of displacement with tenure**





Source: The LOSEF. Estimated results are in Table A9 in the Appendix. The earnings losses are calculated as  $e^{\hat{\delta}_k} - 1$ .

As shown, the FE estimates of the coefficients on the dummies representing the year of displacement and the years after displacement are now positive. Hence, if the length of tenure is the same, the earnings of displaced workers in the postdisplacement job are higher than for workers never displaced. These results seem to indicate that part of the human capital accumulated in the predisplacement job is transferred to the postdisplacement job.

## 7. Concluding remarks

Using panel data from the LOSEF, we investigated the long-term earnings effects of displacement in the Japanese labor market. Adopting a fixed effects model to control for the effects of time-invariant unobserved individual characteristics, we identified the significant negative effects of displacement on monthly earnings. In particular, monthly earnings fell by approximately 21.7% upon displacement. Furthermore, we found the earnings penalty imposed on displaced workers to be persistent, with estimates of earnings losses four years after

displacement remaining at around 16.2%. These figures appear high; however, given that our sample included those who had experienced displacement only once in their career and were reemployed as a regular worker within a year, the obtained estimates of the earnings reductions associated with displacement are presumably quite conservative.

## REFERENCE

Abe, M., Higuchi, Y., Nakamura, M., Kuhn, P., and Sweetman, A. (2002), "Worker displacement in Japan and Canada," In Kuhn, P., ed., *Losing Work, Moving on: International Perspectives on Worker Displacement*. Upjohn Institute for Employment Research, Chapter 3.

Bognanno, M. and Kambayashi, R. (2013), "Trends in worker displacement penalties in Japan: 1991–2005," *Japan and the World Economy*, 27, pp. 41–57.

Couch, K. A., and Placzek, D. W. (2010), "Earnings losses of displaced workers revisited," *American Economic Review*, 100, pp. 572–589.

Hashimoto, M. and Raisian, J. (1985), "Employment tenure and earnings profiles in Japan and the United States," *American Economic Review*, 75, pp. 721–735.

Jacobson, L. S., LaLonde, R. J., and Sullivan, D. G. (1993), "Earnings losses of displaced workers," *American Economic Review*, 83, pp. 685–709.

Kalleberg, A. 2011. *Good Jobs, Bad Jobs: The Rise of Polarized and Precarious Employment Systems in the United States, 1970s to 2000s*. New York: Russell Sage Foundation.

Nakamura, J. and Ohashi, I. (2002), "*Tenshoku no mechanism to sono koka* (The mechanism and effect of job change)" In Genda, Y. and Nakata, Y., eds, *Restora to tenshoku no mechanism* (The mechanism of job loss and job change). Toyokeizaishinnpousha, Ch. 7, pp. 145–173 (in Japanese)

OECD, (2013), *Employment Outlook*, Chapter 4.

Ruhm, C. J. (1991), "Are workers permanently scarred by job displacements?," *American Economic Review*, 81, pp. 319–324.

Stevens, A. H. (1997), "Persistent effects of job displacement: The importance of multiple job losses," *Journal of Labor Economics*, 15, pp. 165–188.

Takayama, N., Inagaki, S., and Oshio, T. (2012), “The Japanese Longitudinal Survey on Employment and Fertility (LOSEF): Essential Features of the 2011 Internet Version and a Guide to Its Users,” PIE/CIS DP-546, Hitotsubashi University.

Takayama, N., Inagaki, S., and Oshio, T. (2013), “The 2012 Japanese Longitudinal Survey on Employment and Fertility (LOSEF): Essential Features of the 2012 Internet Version and a Guide to Its Users,” PIE/CIS DP-608, Hitotsubashi University (in Japanese).

## APPENDIX

**Table A1: Sample characteristics**

	Final sample		Pension-E sample		Original sample	
	Mean	S.d.	Mean	S.d.	Mean	S.d.
<i>Demographic characteristics</i>						
Age	40.10	10.38	44.59	12.61	44.41	12.83
20s	0.145		0.106		0.124	
30s	0.416		0.316		0.303	
40s	0.215		0.215		0.196	
50s	0.195		0.200		0.220	
More than 60	0.029		0.163		0.156	
Female	0.232		0.483		0.492	
University education or higher	0.718		0.516		0.510	
<i>Characteristics of the first Pension-E covered job</i>						
Age first obtained the Pension-E covered job	23.069	2.940	22.26	3.39		
Industry:						
Agriculture, forestry, and fishery	0.003		0.004			
Construction	0.061		0.059			
Manufacturing	0.361		0.263			
Information and communications	0.105		0.089			
Transportation or delivery activities	0.031		0.028			
Wholesale and retail trade	0.102		0.156			
Finance and insurance	0.107		0.101			
Real estate	0.011		0.011			
Scientific research	0.004		0.005			
Accommodation, food, and beverage services	0.004		0.023			
Amusement and leisure	0.003		0.010			
Education	0.011		0.019			
Healthcare and welfare	0.058		0.061			
Other	0.141		0.172			
Occupation:						
Professional/technical	0.409		0.317			
Management	0.078		0.050			
Office work	0.288		0.326			
Sales work	0.097		0.145			
Services work	0.048		0.083			
Security work	0.003		0.003			
Transport/communication	0.012		0.008			
Production/manufacturing/field work	0.056		0.055			
Unknown	0.009		0.013			
Firm size:						
Less than 100	0.207		0.278			
100 to 299	0.118		0.161			
300 to 499	0.063		0.075			
500 to 999	0.108		0.096			
1000 or more	0.505		0.390			
Number of obs.		1403		10651		11962

**Table 2: Characteristics of displacement in the final sample**

	Mean	S.d.
Age when displaced	39.186	10.473
Years spent to find the next Pension-E-covered job after the displacement	0.268	0.329
Years of tenure at the second Pension-E-covered job	6.948	5.970
Change after displacement:		
Moved to a smaller firm	0.593	0.494
Moved to a larger firm	0.186	0.391
Changed industry	0.488	0.503
Changed occupation	0.372	0.486
No. of obs.	86	

**Table A3: Earnings effects of displacement**

Sample Dependent variable Estimated model	LOSEF											
	log of monthly salary											
	OLS			OLS			FE			FE		
	coeff.	s.e.	p-value	coeff.	s.e.	p-value	coeff.	s.e.	p-value	coeff.	s.e.	p-value
3 yrs before	-0.049	0.040	0.221	-0.066	0.031	0.033	-0.010	0.020	0.621	0.001	0.018	0.968
2 yrs before	-0.032	0.040	0.432	-0.070	0.031	0.025	-0.010	0.020	0.635	-0.002	0.018	0.913
1 yr before	-0.034	0.040	0.397	-0.094	0.031	0.002	-0.033	0.020	0.100	-0.027	0.018	0.139
Year of displacement	-0.200	0.040	0.000	-0.285	0.031	0.000	-0.225	0.020	0.000	-0.217	0.018	0.000
1 yr after	-0.154	0.042	0.000	-0.266	0.033	0.000	-0.212	0.021	0.000	-0.199	0.019	0.000
2 yrs after	-0.108	0.046	0.018	-0.239	0.036	0.000	-0.202	0.023	0.000	-0.178	0.021	0.000
3 yrs after	-0.104	0.049	0.033	-0.239	0.038	0.000	-0.198	0.024	0.000	-0.175	0.022	0.000
4 yrs after	-0.097	0.053	0.067	-0.240	0.041	0.000	-0.179	0.026	0.000	-0.162	0.024	0.000
Year	yes			yes			yes			yes		
Age	no			yes			no			yes		
Tenure	no			no			no			no		
Sample size	24399			24399			24399			24399		
Adj. R-sq	0.181			0.506								
F value	104.8			464.3			551.1			736		

Note: All the regressions also control for a dummy variable indicating that the individual is female.

**Table A4: Earnings effects of displacement by worker characteristics**

Sample	LOSEF											
	male/female			educational level less than university/university or higher			displaced from firm with less/more than 1,000 employees			displaced from job in nonmanufacturing/m anufacturing sector		
	log of monthly salary											
	FE			FE			FE			FE		
Dependent variable Estimated model	coeff.	s.e.	p-value	coeff.	s.e.	p-value	coeff.	s.e.	p-value	coeff.	s.e.	p-value
3 yrs before	0.015	0.020	0.468	-0.059	0.028	0.033	0.013	0.022	0.562	0.017	0.021	0.422
2 yrs before	0.008	0.020	0.675	-0.066	0.028	0.017	0.006	0.022	0.795	0.017	0.021	0.412
1 yr before	-0.024	0.020	0.224	-0.085	0.028	0.002	-0.027	0.022	0.227	-0.009	0.021	0.655
Year of displacement	-0.236	0.020	0.000	-0.241	0.028	0.000	-0.178	0.022	0.000	-0.192	0.021	0.000
1 yr after	-0.211	0.021	0.000	-0.212	0.029	0.000	-0.178	0.024	0.000	-0.186	0.022	0.000
2 yrs after	-0.190	0.022	0.000	-0.199	0.031	0.000	-0.150	0.026	0.000	-0.175	0.024	0.000
3 yrs after	-0.169	0.024	0.000	-0.225	0.034	0.000	-0.135	0.029	0.000	-0.166	0.026	0.000
4 yrs after	-0.155	0.025	0.000	-0.205	0.037	0.000	-0.125	0.031	0.000	-0.145	0.027	0.000
Interaction terms:	D = 1 if female			D = 1 if higher than university			D = 1 if 1,000 or more employees			D = 1 if nonmanufacturing		
3 yrs before ×D	-0.074	0.049	0.129	0.104	0.037	0.004	-0.030	0.038	0.432	-0.065	0.042	0.126
2 yrs before ×D	-0.055	0.049	0.257	0.112	0.037	0.002	-0.017	0.038	0.666	-0.077	0.042	0.067
1 yr before ×D	-0.013	0.049	0.798	0.102	0.037	0.005	0.007	0.038	0.846	-0.071	0.042	0.094
Year of displacement ×D	0.105	0.049	0.030	0.042	0.037	0.255	-0.111	0.038	0.004	-0.104	0.042	0.014
1 yr after ×D	0.070	0.052	0.178	0.020	0.038	0.612	-0.056	0.040	0.160	-0.054	0.044	0.227
2 yrs after ×D	0.090	0.061	0.143	0.035	0.042	0.402	-0.073	0.043	0.088	-0.013	0.047	0.785
3 yrs after ×D	-0.044	0.069	0.525	0.084	0.045	0.061	-0.096	0.045	0.033	-0.035	0.051	0.489
4 yrs after ×D	-0.057	0.073	0.435	0.073	0.048	0.129	-0.087	0.048	0.073	-0.074	0.056	0.190
Year	yes			yes			yes			yes		
Age	yes			yes			yes			yes		
Tenure	no			no			no			no		
Sample size	24399			24399			24399			24399		
F value	638.1			638.5			638.2			638		

**Table A5: Earnings effects of displacement including voluntarily separated workers**

Sample	LOSEF								
	w/o ever nonregular worker								
	never/single separated worker (including voluntarily separated )						never/single displaced worker		
	log of monthly earnings								
Dependent variable	OLS			FE			FE		
Estimated model	coeff.	s.e.	p-value	coeff.	s.e.	p-value	coeff.	s.e.	p-value
3 yrs before	-0.001	0.013	0.940	0.008	0.008	0.348	0.001	0.018	0.968
2 yrs before	0.008	0.013	0.536	0.019	0.008	0.020	-0.002	0.018	0.913
1 yr before	-0.005	0.013	0.718	0.006	0.008	0.422	-0.027	0.018	0.139
Year of displacement	-0.130	0.013	0.000	-0.118	0.008	0.000	-0.217	0.018	0.000
1 yr after	-0.084	0.014	0.000	-0.067	0.008	0.000	-0.199	0.019	0.000
2 yrs after	-0.067	0.015	0.000	-0.049	0.009	0.000	-0.178	0.021	0.000
3 yrs after	-0.070	0.015	0.000	-0.045	0.009	0.000	-0.175	0.022	0.000
4 yrs after	-0.075	0.016	0.000	-0.049	0.010	0.000	-0.162	0.024	0.000
Year	yes			yes			yes		
Age	yes			yes			yes		
Tenure	no			no			no		
Sample size	31629			31629			24399		
Adj. R-sq	0.518			0.599			0.601		
F-value	630.2			943.9			735.7		

*Note: All the regressions also control for a dummy variable indicating that the individual is female.*



**Table A6: Earnings effects of displacement including nonstandard job holders**

Sample Dependent variable Estimated model	LOSEF												w/o ever nonstandard worker		
	with ever nonstandard worker						log of monthly salary								
	OLS			OLS			FE			FE			FE		
	coeff.	s.e.	p-value	coeff.	s.e.	p-value	coeff.	s.e.	p-value	coeff.	s.e.	p-value	coeff.	s.e.	p-value
3 yrs before	-0.063	0.028	0.027	-0.061	0.028	0.030	0.015	0.017	0.381	0.013	0.017	0.422	0.001	0.018	0.968
2 yrs before	-0.068	0.028	0.017	-0.066	0.028	0.018	0.010	0.017	0.546	0.009	0.017	0.601	-0.002	0.018	0.913
1 yr before	-0.090	0.028	0.001	-0.030	0.028	0.284	-0.012	0.017	0.479	0.030	0.017	0.083	-0.027	0.018	0.139
Year of displacement	-0.353	0.028	0.000	-0.316	0.028	0.000	-0.274	0.017	0.000	-0.248	0.017	0.000	-0.217	0.018	0.000
1 yr after	-0.276	0.031	0.000	-0.245	0.030	0.000	-0.199	0.018	0.000	-0.176	0.018	0.000	-0.199	0.019	0.000
2 yrs after	-0.249	0.033	0.000	-0.217	0.033	0.000	-0.168	0.019	0.000	-0.145	0.019	0.000	-0.178	0.021	0.000
3 yrs after	-0.253	0.036	0.000	-0.223	0.035	0.000	-0.174	0.021	0.000	-0.150	0.021	0.000	-0.175	0.022	0.000
4 yrs after	-0.235	0.040	0.000	-0.212	0.039	0.000	-0.169	0.023	0.000	-0.148	0.023	0.000	-0.162	0.024	0.000
Year	yes			yes			yes			yes			yes		
Age	yes			yes			yes			yes			yes		
Nonstandard	no			yes			no			yes			no		
Tenure	no			no			no			no			no		
Sample size	26066			26066			26066			26066			24399		
Adj. R-sq	0.494			0.505			0.600			0.601			0.601		
F-value	463.8			475.8			693.2			684.3			735.7		

Note: All the regressions also control for a dummy variable indicating that the individual is female.

**Table A7: Long-term earnings effects of displacement**

Sample Dependent variable Estimated model	LOSEF																				
	log of monthly salary																				
	FE									FE											
	coeff.	s.e.	p-value	coeff.	s.e.	p-value	coeff.	s.e.	p-value	coeff.	s.e.	p-value	coeff.	s.e.	p-value	coeff.	s.e.	p-value			
3 yrs before	0.001	0.018	0.968	-0.005	0.018	0.766	-0.013	0.018	0.485	-0.020	0.018	0.267	-0.028	0.018	0.118	-0.036	0.018	0.050	-0.042	0.018	0.021
2 yrs before	-0.002	0.018	0.913	-0.008	0.018	0.652	-0.016	0.018	0.390	-0.023	0.018	0.201	-0.032	0.018	0.083	-0.039	0.018	0.032	-0.045	0.018	0.013
1 yr before	-0.027	0.018	0.139	-0.033	0.018	0.069	-0.041	0.018	0.025	-0.049	0.018	0.008	-0.057	0.018	0.002	-0.065	0.018	0.000	-0.071	0.018	0.000
Year of displacement	-0.217	0.018	0.000	-0.224	0.018	0.000	-0.231	0.018	0.000	-0.239	0.018	0.000	-0.248	0.018	0.000	-0.256	0.018	0.000	-0.262	0.018	0.000
1 yr after	-0.199	0.019	0.000	-0.206	0.019	0.000	-0.214	0.019	0.000	-0.222	0.019	0.000	-0.232	0.019	0.000	-0.240	0.019	0.000	-0.247	0.019	0.000
2 yrs after	-0.178	0.021	0.000	-0.185	0.021	0.000	-0.194	0.021	0.000	-0.204	0.021	0.000	-0.214	0.021	0.000	-0.224	0.021	0.000	-0.232	0.021	0.000
3 yrs after	-0.175	0.022	0.000	-0.183	0.022	0.000	-0.193	0.022	0.000	-0.203	0.022	0.000	-0.215	0.022	0.000	-0.225	0.022	0.000	-0.234	0.022	0.000
4 yrs after	-0.162	0.024	0.000	-0.171	0.024	0.000	-0.182	0.024	0.000	-0.193	0.024	0.000	-0.206	0.024	0.000	-0.217	0.024	0.000	-0.227	0.024	0.000
5 yrs after				-0.169	0.025	0.000	-0.181	0.025	0.000	-0.193	0.025	0.000	-0.206	0.025	0.000	-0.218	0.025	0.000	-0.229	0.025	0.000
6 yrs after							-0.209	0.026	0.000	-0.223	0.026	0.000	-0.237	0.026	0.000	-0.250	0.026	0.000	-0.261	0.026	0.000
7 yrs after										-0.221	0.028	0.000	-0.236	0.028	0.000	-0.250	0.028	0.000	-0.262	0.028	0.000
8 yrs after													-0.252	0.029	0.000	-0.267	0.029	0.000	-0.280	0.029	0.000
9 yrs after																-0.255	0.031	0.000	-0.269	0.031	0.000
10 yrs after																			-0.249	0.035	0.000
Year	yes			yes			yes			yes			yes			yes					
Age	yes			yes			yes			yes			yes			yes					
Tenure	no			no			no			no			no			no					
Sample size	24600			24399			24399			24399			24399			24399					
F value	865.9			724.1			713.8			703.9			695			685.9					

**Table A8-1: Earnings effects of displacement for multiply displaced workers**

Sample	LOSEF											
	w/o ever nonstandard worker						w/o ever nonstandard worker					
	with multiple displaced worker						never/single displaced worker					
	log of monthly salary											
Dependent variable	OLS			FE			OLS			FE		
Estimated model	coeff.	s.e.	p-value	coeff.	s.e.	p-value	coeff.	s.e.	p-value	coeff.	s.e.	p-value
3 yrs before	-0.107	0.020	0.000	-0.017	0.012	0.152	-0.066	0.031	0.033	0.001	0.018	0.968
2 yrs before	-0.109	0.020	0.000	-0.020	0.012	0.102	-0.070	0.031	0.025	-0.002	0.018	0.913
1 yr before	-0.121	0.020	0.000	-0.031	0.012	0.010	-0.094	0.031	0.002	-0.027	0.018	0.139
Year of displacement	-0.313	0.020	0.000	-0.224	0.012	0.000	-0.285	0.031	0.000	-0.217	0.018	0.000
1 yr after	-0.252	0.021	0.000	-0.168	0.013	0.000	-0.266	0.033	0.000	-0.199	0.019	0.000
2 yrs after	-0.208	0.023	0.000	-0.137	0.014	0.000	-0.239	0.036	0.000	-0.178	0.021	0.000
3 yrs after	-0.208	0.026	0.000	-0.136	0.015	0.000	-0.239	0.038	0.000	-0.175	0.022	0.000
4 yrs after	-0.200	0.028	0.000	-0.127	0.017	0.000	-0.240	0.041	0.000	-0.162	0.024	0.000
Year	yes			yes			yes			yes		
Age	yes			yes			yes			yes		
Tenure	no			no			no			no		
Sample size	27402			27402			24399			24399		
Adj. R-sq	0.49						0.506					
F-value	489.4			752.7			464.3			735.7		

**Table A8-2: Earnings effects of displacement for multiply displaced workers  
(Examines only the first displacement of each individual)**

Sample	LOSEF											
	w/o ever nonstandard worker						w/o ever nonstandard worker					
	with multiple displaced worker						never/single displaced worker					
	log of monthly salary											
Dependent variable	OLS			FE			OLS			FE		
Estimated model	coeff.	s.e.	p-value	coeff.	s.e.	p-value	coeff.	s.e.	p-value	coeff.	s.e.	p-value
3 yrs before	-0.107	0.020	0.000	-0.017	0.012	0.152	-0.066	0.031	0.033	0.001	0.018	0.968
2 yrs before	-0.109	0.020	0.000	-0.020	0.012	0.102	-0.070	0.031	0.025	-0.002	0.018	0.913
1 yr before	-0.121	0.020	0.000	-0.031	0.012	0.010	-0.094	0.031	0.002	-0.027	0.018	0.139
Year of displacement	-0.313	0.020	0.000	-0.224	0.012	0.000	-0.285	0.031	0.000	-0.217	0.018	0.000
1 yr after	-0.252	0.021	0.000	-0.168	0.013	0.000	-0.266	0.033	0.000	-0.199	0.019	0.000
2 yrs after	-0.208	0.023	0.000	-0.137	0.014	0.000	-0.239	0.036	0.000	-0.178	0.021	0.000
3 yrs after	-0.208	0.026	0.000	-0.136	0.015	0.000	-0.239	0.038	0.000	-0.175	0.022	0.000
4 yrs after	-0.200	0.028	0.000	-0.127	0.017	0.000	-0.240	0.041	0.000	-0.162	0.024	0.000
Year	yes			yes			yes			yes		
Age	yes			yes			yes			yes		
Tenure	no			no			no			no		
Sample size	27402			27402			24399			24399		
Adj. R-sq	0.49						0.506					
F-value	489.4			752.7			464.3			735.7		

**Table A9: Earnings effects of displacement with tenure**

Sample Dependent variable Estimated model	LOSEF											
	log of monthly salary											
	OLS			FE			OLS			FE		
	coeff.	s.e.	p-value	coeff.	s.e.	p-value	coeff.	s.e.	p-value	coeff.	s.e.	p-value
3 yrs before	-0.073	0.031	0.018	-0.022	0.018	0.224	-0.066	0.031	0.033	0.001	0.018	0.968
2 yrs before	-0.077	0.031	0.012	-0.025	0.018	0.157	-0.070	0.031	0.025	-0.002	0.018	0.913
1 yr before	-0.091	0.036	0.011	-0.063	0.021	0.002	-0.094	0.031	0.002	-0.027	0.018	0.139
Year of displacement	-0.136	0.033	0.000	0.147	0.021	0.000	-0.285	0.031	0.000	-0.217	0.018	0.000
1 yr after	-0.118	0.034	0.001	0.148	0.021	0.000	-0.266	0.033	0.000	-0.199	0.019	0.000
2 yrs after	-0.093	0.036	0.011	0.141	0.022	0.000	-0.239	0.036	0.000	-0.178	0.021	0.000
3 yrs after	-0.100	0.039	0.010	0.113	0.023	0.000	-0.239	0.038	0.000	-0.175	0.022	0.000
4 yrs after	-0.105	0.042	0.011	0.100	0.025	0.000	-0.240	0.041	0.000	-0.162	0.024	0.000
Year	yes			yes			yes			yes		
Age	yes			yes			yes			yes		
Tenure	yes			yes			no			no		
Sample size	24375			24375			24399			24399		
Adj. R-sq	0.512						0.506					
F value	457.3			763.7			464.3			735.7		

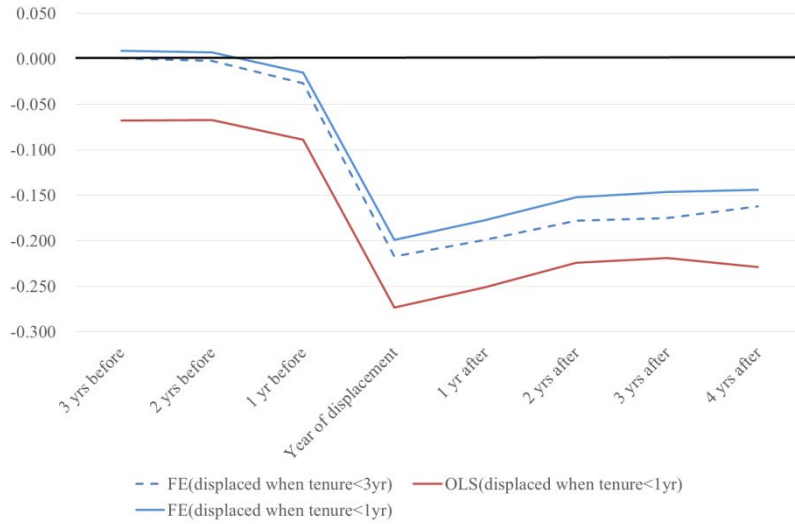
Note: All the regressions also control for a dummy variable indicating that the individual is female.

**Table A10: Earnings effects of displacement including short-tenured worker**

Sample Dependent variable Estimated model	LOSEF											
	w/o ever nonstandard worker											
	displaced when tenure < 1yr						displaced when tenure < 3yr					
	OLS			FE			OLS			FE		
	coeff.	s.e.	p-value	coeff.	s.e.	p-value	coeff.	s.e.	p-value	coeff.	s.e.	p-value
3 yrs before	-0.068	0.030	0.022	0.009	0.017	0.611	-0.066	0.031	0.033	0.001	0.018	0.968
2 yrs before	-0.067	0.029	0.021	0.007	0.017	0.670	-0.070	0.031	0.025	-0.002	0.018	0.913
1 yr before	-0.089	0.029	0.002	-0.015	0.017	0.383	-0.094	0.031	0.002	-0.027	0.018	0.139
Year of displacement	-0.273	0.029	0.000	-0.199	0.017	0.000	-0.285	0.031	0.000	-0.217	0.018	0.000
1 yr after	-0.251	0.031	0.000	-0.177	0.018	0.000	-0.266	0.033	0.000	-0.199	0.019	0.000
2 yrs after	-0.224	0.033	0.000	-0.152	0.019	0.000	-0.239	0.036	0.000	-0.178	0.021	0.000
3 yrs after	-0.219	0.035	0.000	-0.146	0.020	0.000	-0.239	0.038	0.000	-0.175	0.022	0.000
4 yrs after	-0.229	0.037	0.000	-0.144	0.022	0.000	-0.240	0.041	0.000	-0.162	0.024	0.000
Year	yes			yes			yes			yes		
Age	yes			yes			yes			yes		
Tenure	no			no			no			no		
Sample size	24826			24826			24399			24399		
Adj. R-sq	0.507						0.506					
F value	473.4			740			464.3			735.7		

Note: All the regressions also control for a dummy variable indicating that the individual is female.

**Figure A1: Earnings effects of displacement including short-tenured worker**



**Figure A2: Earnings effects of voluntary separation**

