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The Effect of the Great East Japan Earthquake on the Evacuees' Unemployment and Earnings

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The Effect of the Great East Japan Earthquake on the Evacuees' Unemployment and Earnings

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Abstract

This study analyzes the impact of evacuation status on labor market outcomes such as employment and earnings following the Great East Japan Earthquake by using annual microdata from the 2012 Employment Status Survey in Japan. This is the first research that comprehensively examines the effect of evacuation status on labor market performance for evacuees of the Great East Japan Earthquake. The evacuation status categories are (1) evacuated and still away from home, (2) evacuated and moved to another place, (3) evacuated and already returned home, and (4) did not evacuate. We applied a probit model to estimate unemployment and an ordinary least squares regression to estimate earnings. To estimate unemployment and earnings, we also used propensity score matching to control for selection into evacuation status on observable characteristics. After controlling for selection into evacuation categories on observable characteristics, our findings show that those still away from home and those who moved tend to have the worst labor market performance in terms of probability of unemployment and annual earnings. The estimates suggest that we need a specific employment support for those who evacuated especially for those who are still away from home and those who moved to another place.

Keywords: natural disaster, earthquake, labor market, employment, earnings
JEL classifications: H12, J21, J30[1]

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1. Introduction

The Great East Japan Earthquake on March 11, 2011 caused large damage to Japanese society and its economy. The earthquake and subsequent tsunami also damaged nuclear plants in Fukushima prefecture, resulting in the release of radioactive substances into the environment. While six years has passed since the earthquake, the Japanese government is still struggling to accelerate the reconstruction and recovery of the economy in damaged areas to provide life support to evacuees.

Genda(2014) examines the impact on labor market from the Great East Japan Earthquake. He finds the workers who left a job or took a leave of absence as well as those who evacuated or moved to other municipalities because of the earthquake were less likely to have a job, want to work, and look for a job. Groen and Polivka (2008) analyze the impact of Hurricane Katrina on the labor outcomes of evacuees and find that evacuees who were unable to return to their original residence location suffered a more disadvantageous position in the labor market than evacuees who returned home.

This study analyzes the impact on the labor market outcomes of the evacuees of the Great East Japan Earthquake by using annual microdata from the 2012 Employment Status Survey (ESS) in Japan. The ESS is a nationally representative survey of usual labor force status in Japan. It was conducted on household members aged 15 years old and over in approximately 470,000 households in October 2012. The 2012 survey included additional questions on the impact of the Great East Japan Earthquake on jobs with regular questions on household and labor force status. As far as the authors know, this is the first research focusing on the effect of evacuation status after the Great East Japan Earthquake on labor market performance by using a micro-level dataset that includes rich information on each individual. We explore the effects not only on the employment status of evacuees, but also on their earnings.

Evacuation status was categorized as (1) evacuated and still away from home, (2) evacuated and moved to another place, (3) evacuated and already returned home, and (4) did not evacuate. We applied a probit model to estimate unemployment and ordinary least squares to estimate earnings. We also used propensity score matching (PSM) to control for selection into evacuation status on observable characteristics when we estimate unemployment and earnings. After controlling for selection into evacuation categories on observable characteristics, our findings show that those still away from home and those

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who moved tend to have the worst labor market performance in terms of employment and earnings.

The study contributes to the literature in the following twofold. First, to our knowledge, this is the first attempt that comprehensively examines the effect of evacuation status on the labor market performance. The rich ESS data allow us to investigate four evacuation status categories, and they are more detailed categories than the ones in the previous studies. Previous studies does not have "evacuated and moved" category. Secondly, we attempt to control for possible endogeneity bias caused by the evacuation status selection by adopting PSM.

Our estimation results indicate that (1) the persons who moved have the highest probability of being unemployed and followed by those who are still away; those who still away have higher possibility to be unemployed by around 2.0% points compared to those who did not evacuate, while those who moved have higher possibility to be unemployed by 5-9 % points those who did not evacuate, and (2) the persons who evacuated, especially those still away from home and those who moved, tend to have less annual earnings compared to those who did not evacuate.

The remainder of this paper is organized as follows. Section 2 reviews previous studies. Section 3 describes hypotheses and methods of estimation. Section 4 is an introduction to the data used. Section 5 provides the descriptive statistics, while section 6 states the estimation results, summary, discussion of the findings and policy implications. The last section presents the main conclusions.

2. Literature Review

Given the increasing trend of natural disasters globally, the amount of research on their economic impact has been rising. Earthquakes, storms, floods, and tsunamis cause average economic losses of USD 250–300 billion each year. Assuming everyone equally shares the risk of exposure to hazardous events, this would be equivalent to an annual loss of approximately USD 70 for each individual in the working age group (UNISDR, 2015). The economic impacts caused by natural disasters are estimated to be not only the direct damage, including the loss of lives and infrastructure, but also the indirect damage such as the effects on businesses, tourism, labor markets, and economic growth. While the mass media and national governments focus overwhelmingly on the direct damage, the latter is a greater concern for economics researchers.

In the United States where natural disasters such as hurricanes have hit several times, economics researchers have examined such exogenous shocks in the given market. Among the various statistical techniques used, the difference-in-difference estimation is commonly adopted (Belasen & Polachek, 2009; McIntosh, 2008; Groen & Polivka, 2008). For example, to measure the effects of hurricanes on employment and earnings in Florida, Belasen and Polachek (2009) compare counties hit by hurricanes with those counties not hit. They also take into account the possibility of labor demand and labor supply changing in the neighboring county. The exogenous shock represented by a hurricane seems to shift the labor supply of stricken counties inward, thus decreasing employment in the stricken county and increasing earnings substantially. At the same time, workers leave the devastation and flee to neighboring counties. Those counties experience a sudden increase in labor supply, moving the equilibrium downward and thereby reducing workers' earnings. If labor demand in the neighboring county is inelastic, the migration of workers does not lead to higher employment in that county. However, the study does not investigate the characteristics of workers who evacuated or explore whether these determine the possibility of employment and the amount of earnings.

McIntosh (2008) confirms the change in the labor market equilibrium of a neighboring area following an evacuation. The Hurricane Katrina migration to Houston, Texas was associated with a decline in wages and in the probability of being employed among the native population. Workers in sectors or occupations that faced greater labor market competition after the arrival of evacuees suffered the most. On the contrary, the inflow of low-skilled immigrants from Central America to the United States seemed to complement high-skilled native male workers and led to higher hourly wages for this group (Kugler & Yuksel, 2008).

A significant body of research examines the effects of Hurricane Katrina on the labor market because of its severe damage to human capital, not only those killed but also those forced to leave their hometowns. Some studies emphasize measuring hurricane impact by migration status (Groen & Polivka, 2008; Zissimopoulos & Karoly, 2010). After a hurricane hits, people have to evacuate to new areas and new labor markets with which they might be unfamiliar and lacking in social networks. Thus, they face higher costs of seeking jobs, which put them into a disadvantageous position. Specifically, the effects of Hurricane Katrina lowered the labor force participation rate, lowered the employment-population ratio, and raised the unemployment rate of evacuees according to these studies.

Further, among evacuees after such a natural disaster, workers who do not return home have worse labor outcomes. Although individual and family background accounts for some extent of the differences, the primary reason is that non-returnees come from areas that experience greater residence damage (Groen & Polivka, 2008). For example, Zissimopoulos and Karoly (2010) compare non-evacuees, returnee evacuees, and non-returnee evacuees by affected states and find that a natural disaster leads to different experiences for different subgroups of the population and state. Non-returnee evacuees are more severely affected by a hurricane, with many pushed into self-employment.

Regarding research on the impact of the Great East Japan Earthquake, Genda (2014) addresses similar topics to us and uses the same dataset as that presented herein. Genda (2014) analyzes a number of factors:

(1) The determinants of being affected by the earthquake on employment among those employed when the earthquake hit, using a probit model,

(2) The determinants of the changes in employment (taking a leave of absence, leaving one's job) among those employed when the earthquake hit, using a multinomial logit model,

(3) The determinants of being workless among those who took a leave of absence or left one's job, using a probit model and conducting analyses separately for all regions and affected municipalities,

(4) The determinants of willingness to work among those who took a leave of absence or left one's job, having no job in October 2012, using a probit model,

(5) The determinants of looking for a job among those took a leave of absence or left one's job, having no job in October 2012, using a probit model, and

(6) The effect of evacuation, change of residence, and place of living affected by the earthquake on whether a respondent is employed, willing to work, and looking for a job among those who left a job or took a leave of absence because of the earthquake.

Based on the results, Genda (2014) concludes that the earthquake affected not only those in Iwate, Miyagi, and Fukushima but also those in all prefectures in eastern Japan excluding Hokkaido, especially middle-aged and older generations and less educated groups. In addition, permanent employees tended to be protected and less affected. The manufacturing sector was greatly affected but manufacturing workers were less affected in terms of being workless in fall 2012. He also suggests that those who left a job or took a leave of absence because of the earthquake were much more likely to be without a job in the affected municipalities than those in other municipalities. The negative effect was the strongest in municipalities that included evacuated areas in Fukushima. However, the people in these municipalities did not lose their willingness to work, although they were less likely to look for a job.

Genda (2014) also finds that evacuation and change of residence because of the earthquake were greatly associated with being jobless after leaving a job or taking a leave of absence after the earthquake. Those who left a job or took a leave of absence as well as those who evacuated or moved to other municipalities were less likely to have a job, want to work and look for a job.

This study replicates the previous analyses by Groen and Polivka (2008) and Zissimopoulos and Karoly (2010), but measures the impacts of the Great East Japan Earthquake in 2011. It segregates evacuees into three groups, namely evacuees who were still away, evacuees who decided to move, and returnees, while previous studies have divided them into only returnees and non-returnees. Unlike Groen and Polivka (2008), Zissimopoulos and Karoly (2010) and Genda (2014) that focus on employment, our study extends the investigation to additionally assess the impacts of the earthquake on earnings.

Although the topic is similar, this study is different from Genda (2014) in several aspects. We focus more on the effect of evacuation status (evacuated and returned home, evacuated and moved, evacuated and still evacuating, did not evacuate). This study also looks at differences by affected prefecture on the effect of evacuation status. Further, our study looks at the effect on earnings. Lastly, we attempt to control for selection into evacuation status by PSM on observable characteristics when we estimate the effect of evacuation status on employment.

3. Research Questions, Hypotheses, and Methods of Estimation

We estimate the impact of the Great East Japan Earthquake on two labor market outcomes, namely employment status, and earnings, by evacuation status. This study investigates the differences among three types of evacuees: 1) those who evacuated and are still away from home, 2) those who evacuated and decided to move to another place when the earthquake hit, and 3) those who evacuated and returned home compared with those who did not evacuate. This segregation extends the work of Groen and Polivka (2008) and Zissimopoulos and Karoly (2010), which divides Katrina evacuees into returnees and non-returnees.

Our research questions are as follows:

(1) How does evacuation status affect the probability of unemployment?

(2) How does evacuation status affect annual earnings?

Then, our hypotheses to the research question above are:

(1) Those who are still away from home have the largest probability of unemployment, followed by those who have moved because these groups have less social networks compared to those who returned home or those who did not evacuate.

(2) Those who are still away from home have the least annual earnings, followed by those who have moved because these groups have less social networks and it is more difficult for them to find decent jobs with decent wages.

3.1 Estimating the Probability of Unemployment by Evacuation Status

First, we perform a probit estimation of the probability of being unemployed and employed by evacuation status, controlling for demographic characteristics. The baseline probit model in our analysis is

$$\Pr(Y_i = 1|\mathbf{X}_i) = \Phi(\boldsymbol{X_i}\boldsymbol{\beta}) \quad (1)$$

where Y_i is a binary dependent variable where 1 means being unemployed and 0 means being employed for individual i. Φ is the cumulative density function of a standard normal random variable. $\boldsymbol{X}_i$ is a vector of the explanatory variables affecting the unemployment status decision of individual i, including dummy variables on evacuation status (still away, moved, and back home), female dummy, age, age squared, marital status, the number of children under 15 years old, dummy variables of prefecture where individual *i* lives in October 2012, and education level dummies. $\boldsymbol{\beta}$ is the parameter vector of each explanatory variable. The second probit model includes interactions of evacuation status dummies and a prefecture where individual *i* lived when the earthquake hit in addition to the variables in the baseline model.

To control for sample selection bias into evacuation status as much as possible based on observable characteristics, we use PSM[2][3]. Since PSM is used to compare the outcomes of two groups and we cannot construct a statistical model to compare more than two groups, we control for selection bias in two groups here. We estimated the probabilities of unemployment among those (i) who evacuated and are still away from home compared with those who did not evacuate, (ii) who evacuated and moved compared with those who did not evacuate, and (iii) who evacuated and returned home compared with those who did not evacuate.

The propensity score is the conditional probability of assignment to a particular treatment given the observed covariates (Rosenbaum & Rubin, 1983). PSM constructs a statistical comparison group based on the propensity score estimated by the observed characteristics. People in the treatment group are matched to those, not in the treatment group based on the propensity score. Propensity score is the probability of being in the

[2] We considered using instrumental variable method but could not find valid instruments from the given dataset. We know PSM would not solve the issue of reverse causality while instrumental variables do. However, we do not think reverse causality is a severe problem in our estimation because the situation that people have to evacuate is an exogenous shock. It is still possible that people who find jobs or better jobs tend to move but we did our best to estimate the propensity score by available individual characteristics.

[3] We used Stata for estimation and used “teffects psmatch” as command to estimate PSM because “teffects” solves the problem of standard errors psmatch2 had (Social Science Computing Cooperative, University of Wisconsin, 2015). For more information, please refer to StataCorp LP (2015).

treatment, D give the observed characteristics: $P(X) = \Pr(D = 1|X)$. Then, average treatment effect on the treated (ATT) is estimated by calculating the mean difference in outcomes across the two groups. The PSM estimator for ATT can be written as below assuming that conditional independence holds and that there is common support (overlap between both groups).

$$\tau_{ATT}^{PSM} = E_{P(X)|D=1}\{E[Y(1)|D = 1, P(X)] - E[Y(0)|D = 0, P(X)]\} \qquad (2)$$

where τ_{ATT}^{PSM} is defined as the unemployment probability differential between those who evacuated and are still away (moved or returned) and those who did not evacuate. $Y(1)$ indicates outcomes for those who are in treatment group (one of three evacuation statuses) and $Y(0)$ outcomes for those who are in control group (non-evacuee). $D=1$ means "evacuated and still away (moved or returned)," $D=0$ means "did not evacuate," Y is unemployment status (1 if unemployed, 0 otherwise), and X is individual characteristics, which are the gender, age, age squared, marital status, number of children under 15, official unemployment rate by prefecture where respondents live, and education dummies. PSM is the only decent method we could currently think of in order to control for selection into evacuation status as much as possible. However, as suggested from the explanation above, we have to note that PSM cannot control for selection bias on unobserved characteristics and therefore the estimates by PSM could still have some bias. In any case, since we match people in two groups on the same observable characteristics using PSM, and drop those who cannot be matched, the estimates of PSM should have less bias than those of probit models.

3.2 Estimating Earnings by Evacuation Status

Second, we estimate the effects of evacuation status and the other characteristics on earnings by using OLS. Originally, the data on annual earnings are categorical. Therefore we calculated the mean of the lower bound and upper bound for each category to change the variable into a continuous variable. The baseline OLS model in our analysis is

$$y_i = \ln Y_i = \boldsymbol{X_i \beta} \qquad (3)$$

where $\ln Y_i$ is log of annual earning of individual *i*. $\boldsymbol{X}_i$ is a vector of the explanatory variables affecting annual earning of individual *i*, including dummy variables on evacuation status (still away, moved, and back home), female dummy, experience, experience squared, marital status, the number of children under 15 years old, dummy variables of prefecture where individual *i* lives in October 2012 to control for prefecture fixed effect, and education level dummies. $\boldsymbol{\beta}$ is the parameter vector of each explanatory variable. The second OLS model includes interactions of evacuation status and a prefecture where individual *i* lived when the earthquake hit in addition to the variables in the baseline model.

To control for sample selection bias into evacuation status as much as possible based on observable characteristics, we also use PSM to estimate annual earnings. We estimated log of annual earnings among those (i) who evacuated and are still away from home compared with those who did not evacuate, (ii) who evacuated and moved compared with those who did not evacuate, and (iii) who evacuated and returned home compared with those who did not evacuate.

As same as the unemployment estimation, the PSM estimator for ATT can be written as below assuming that conditional independence holds and that there is common support (overlap between both groups).

$$\tau_{ATT}^{PSM} = E_{P(X)|D=1}\{E[Y(1)|D=1, P(X)] - E[Y(0)|D=0, P(X)]\} \qquad (2)$$

where τ_{ATT}^{PSM} is defined as differential in log of annual earnings between those who evacuated and are still away (moved or returned) and those who did not evacuate. $Y(1)$ indicates outcomes for those who are in treatment group (one of three evacuation statuses) and $Y(0)$ outcomes for those who are in control group (non-evacuee). $D=1$ means "evacuated and still away (moved or returned)," $D=0$ means "did not evacuate," Y is unemployment status (1 if unemployed, 0 otherwise), and X is individual characteristics, which are the gender, age, age squared, marital status, number of children under 15, prefecture dummies where a respondent lived when the earthquake hit, and education dummies.

4. Data

The dataset used in this study is the 2012 ESS in Japan, a nationally representative survey of labor force status in Japan, and it was conducted on approximately 470,000 household members aged 15 years old or more in October 2012. The 2012 survey includes additional questions on the impact of Great East Japan Earthquake on the job with the regular questions on the household and labor force status. In the probit model used to estimate the effect of evacuation status and the other characteristics on unemployment, the dependent variable is binary and equals 1 if individual *i* is unemployed in October 2012 and 0 otherwise. The independent variables are the three types of evacuation status and female dummy (1 if female, 0 otherwise), age, age squared, marital status dummy (1 if married, 0 otherwise), number of children under 15 years old, dummies of prefectures where respondents are living at the time of the survey, and education level dummies.

In the OLS used to estimate earnings, the dependent variable is the log of annual earnings (wages/salaries or business profits). The original data on annual earnings is categorical. The earnings categories start from "no earnings or less than 500,000 yen" followed by "500,000 to 990,000 yen" and "1,000,000 to 1,490,000 yen." After the second category, we have categories for every 500,000 yen until "2,500,000 to 2,990,000 yen." From 3,000,000 yen, we have categories for every 1,000,000 yen ("3,000,000 to 3,990,000 yen") up to "9,000,000 to 9,990,000 yen." The last three categories are "10,000,000 to 12,490,000 yen," "12,500,000 to 14,990,000 yen," and "More than 15,000,000 yen." To run OLS regression, we get the mean of lower bound and upper bound of each earning category and create a continuous annual earning variable. The value of new variable is either 250,000 yen, 750,000 yen, 1,250,000 yen, 1,750,000 yen, 2,250,000 yen, 2,750,000 yen, 3,500,000 yen, 4,500,000 yen, 5,500,000 yen, 6,500,000 yen, 7,500,000 yen, 8,500,000 yen, 9,500,000 yen, 11,250,000 yen, and 13,750,000 yen. Since we could not get the mean for the category "More than 15,000,000 yen", we did not include those who earn "more than 15,000,000 yen" in our analysis. The independent variables in the model are three types of evacuation status (explained later), female dummy, years of experience, years of experience squared, marital status dummy (1 if married, 0 otherwise), number of children under 15 years old, dummies of prefectures where respondents are living at the time of the survey, education level dummies, and industry dummies.

Lastly, evacuation status (in October 2012) in both models is categorized into three groups: (1) those who evacuated after the earthquake and still live away from home, (2) those who evacuated after the earthquake and have already moved to another place, and (3) those who evacuated after the earthquake and returned home. The base category is those who did not evacuate.

5. Descriptive Statistics

According to the ESS, 11,771 evacuees of the earthquake are in the labor force (Table 1). The majority of these are from Fukushima, from which many people were evacuated fearing radiation sickness. The second and third largest groups of evacuees come from Miyagi (3,574 evacuees) and Iwate (1,369 evacuees), respectively. More than half of evacuees, however, returned home in 2012. Approximately 28.3% of evacuees report that they are still away from home and 15.1% have moved to another place. The highest proportions of returnees are from Aomori, Ibaraki, and Chiba since these three prefectures experienced only a minor impact from the earthquake. Whereas most evacuees from other prefectures returned home, 57.3% of evacuees from Iwate are still away from home. More than 20% of evacuees in Miyagi, Ibaraki, and Chiba decided to move to another place.

Table 1: Evacuee Status by Prefecture of Residence, 15 to 64 Years Old

Prefecture lived during earthquake	Type of evacuation			Total evacuees
	Away	Moved	Returnee	
青森県 Aomori	0 (0.00%)	37 (13.45%)	238 (86.55%)	275 (100%)
岩手県 Iwate	784 (57.27%)	169 (12.34%)	416 (30.39%)	1,369 (100%)
宮城県 Miyagi	1,028 (28.76%)	786 (21.99%)	1,760 (49.24%)	3,574 (100%)
福島県 Fukushima	1,456 (27.14%)	524 (9.77%)	3,384 (63.09%)	5,364 (100%)
茨城県 Ibaraki	27 (4.48%)	177 (22.84%)	571 (73.68%)	775 (100%)
千葉県 Chiba	38 (9.18%)	88 (21.26%)	288 (69.57%)	414 (100%)
Total	3,333 (28.32%)	1,781 (15.13%)	6,657 (56.55%)	11,771

Note: The sample covered here is the working age population (15 to 64 years old) in the labor force (employed or unemployed).

It is also evident from ESS that the unemployment rates of evacuees are higher than those of non-evacuees for both men and women. According to Table 2 showing unemployment rates by evacuation status, 8.4% of male labor force who is still away from home is unemployed, 8.8% of male labor force who have moved to another place is unemployed and 4.7% of male labor force who returned home is unemployed, while only 4.4% of males who did not evacuate is unemployed. Similarly, 14.9% of female labor force who is still away from home are unemployed, 17.6% of female labor force who have moved to another place is unemployed and 9.5% of female labor force who are still away from home are unemployed, while 7.7% of female labor force who did not evacuate is unemployed. Moreover, women are more likely to be jobless for all evacuation statuses. The female unemployment rate is nearly twice as large as the male unemployment rate.

Table 2: Unemployment Rate by Evacuee Status, 15 to 64 Years Old

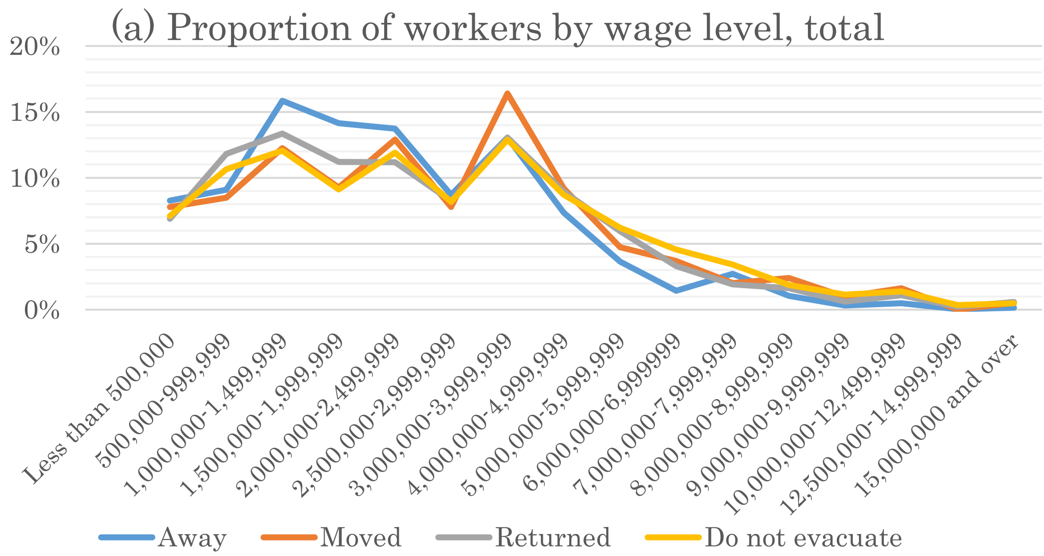
	Evacuee			Do not evacuate
	Away	Moved	Returnee	
Male	8.40%	8.77%	4.72%	4.40%
Female	14.89%	17.61%	9.52%	7.65%
Total	11.13%	12.63%	7.03%	5.85%

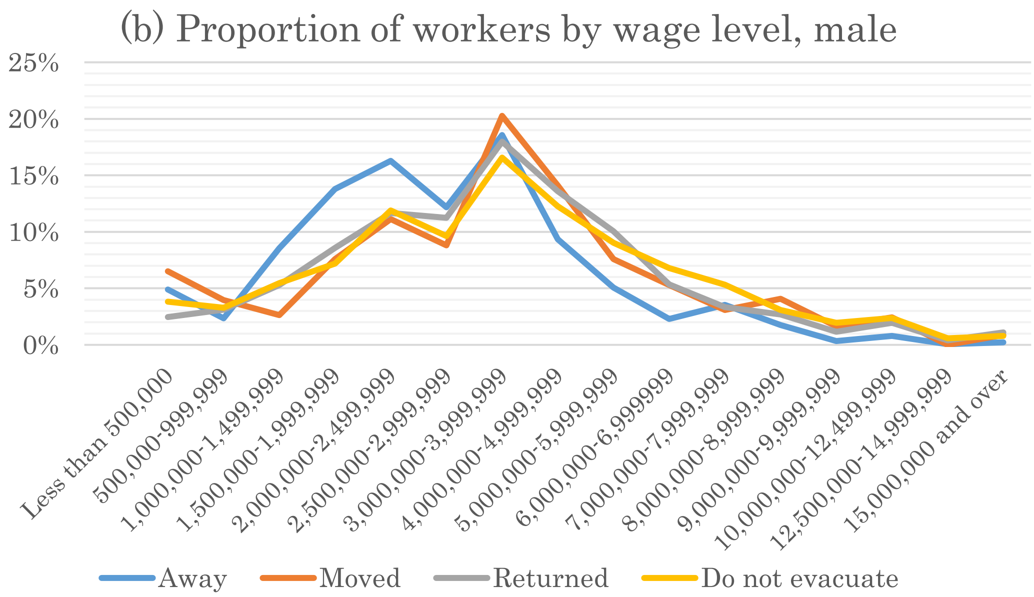
Notes: This table covers those who are of working age (15 to 64 years old) and in the labor force. The sample covered here are those who used to live in either Aomori, Iwate, Miyagi, Fukushima, Ibaraki & Chiba before the earthquake. The sample in the fifth column covers those who live in

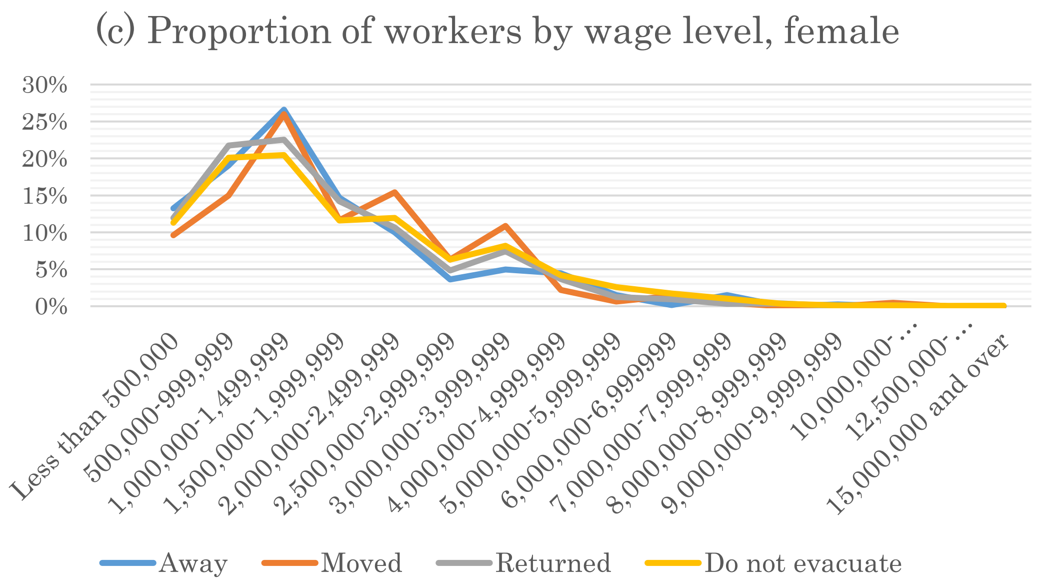
Figure 1a reports the proportion of workers at each earning level, starting from less than 500,000 yen per annum to greater than 15,000,000 yen per annum. The data is defined by evacuation status. A person who reports being away because of the earthquake is more likely to have lower earnings. Less than 4% of this group have annual earnings between 5,000,000 and 5,990,000 yen compared with more than 6% of non-evacuees. Evacuees who moved to another place tend to receive higher annual earnings than those away because the group has a smaller proportion of workers in the low earnings category. Returnees seem to earn less (more) than those who moved (are still away). Non-evacuees, on average, enjoy higher earnings than all other types of evacuees. The data indicate a higher proportion of non-evacuees at almost every wage level above 4 million yen per annum. In addition, a lower proportion of non-evacuees tends to be found in the lower earnings category.

Segregated by gender (Figures 1b & 1c), there is a higher proportion of female workers in the lower earnings category compared with male workers. This pattern seems to switch at an earning level of 1.5 million yen per annum where male workers start to have a higher proportion. The earning distributions of returnees and non-evacuees are similar for both male and female workers.

Figure 1: Proportion of Workers by Earnings Level, 15 to 64 Years Old (in 1,000 yen)


(a) Proportion of workers by wage level, total
20%
15%
10%
5%
0%
Less than 500,000
500,000-999,999
1,000,000-1,499,999
1,500,000-1,999,999
2,000,000-2,499,999
2,500,000-2,999,999
3,000,000-3,999,999
4,000,000-4,999,999
5,000,000-5,999,999
6,000,000-6,999999
7,000,000-7,999,999
8,000,000-8,999,999
9,000,000-9,999,999
10,000,000-12,499,999
12,500,000-14,999,999
15,000,000 and over
Away
Moved
Returned
Do not evacuate


(b) Proportion of workers by wage level, male
25%
20%
15%
10%
5%
0%
Less than 500,000
500,000-999,999
1,000,000-1,499,999
1,500,000-1,999,999
2,000,000-2,499,999
2,500,000-2,999,999
3,000,000-3,999,999
4,000,000-4,999,999
5,000,000-5,999,999
6,000,000-6,999999
7,000,000-7,999,999
8,000,000-8,999,999
9,000,000-9,999,999
10,000,000-12,499,999
12,500,000-14,999,999
15,000,000 and over
Away
Moved
Returned
Do not evacuate



Notes: The sample covered here is the working age population (15 to 64 years old) in the labor force (employed or unemployed) who were living in either Aomori, Iwate, Miyagi, Fukushima, Ibaraki, or Chiba at the time of the earthquake.

Table 3 reports the characteristics of workers by evacuation status. Some of these observed characteristics might have resulted in differences in employment status and earnings even before the Great East Japan Earthquake. The illustration shows that evacuees who decided to move, on average, are several years younger than workers of other evacuation statuses. Those who are still away and moved are also more likely to be male compared with non-evacuees and returnees. Those who moved are also more likely to be non-married compared to all other evacuation statuses. Moreover, evacuees who report being away are less likely to have a high level of education. More than 80% of "away" evacuees graduated from senior high school or lower. Evacuees who decide to move are more likely to have a higher education level than the "away", "returnee" and "do not evacuate" groups. Looking at the industry variables, it is noticeable that those who are away from home are more likely to work in fishery and construction sector.

Table 3: Characteristics by Evacuation Status, 15 to 64 Years Old

Characteristics	**Type of evacuation (those who lived in either of the six affected prefectures when the earthquake hits)**			
	Away	**Moved**	**Returnee**	**Do not evacuate**

Age	44.42	36.58	41.77	44.38
Female (%)	42.12%	43.68%	48.13%	44.70%
Married (%)	61.77%	56.00%	66.58%	64.54%
Number of children under 15 years	0.50	0.62	0.70	0.50
Education dummies				
Junior high and lower (%)	15.27%	5.51%	8.98%	9.20%
Senior high (%)	64.83%	46.09%	56.61%	53.85%
Post secondary vocational education and training (%)	5.57%	11.71%	7.80%	7.93%
Junior college (%)	5.84%	9.34%	8.14%	7.87%
College (%)	8.04%	23.35%	16.73%	19.61%
Graduate school (%)	0.24%	4.00%	1.50%	1.54%
Years of experience	26.31	17.11	22.94	24.45
Industry dummies				
Agriculture and forestry	1.86%	1.35%	1.62%	4.60%
Fisheries	2.87%	0.70%	0.71%	0.64%
Mining and quarrying of stone and gravel	0.00%	0.00%	0.00%	0.00%
Construction	15.88%	9.70%	10.08%	9.00%
Manufacturing	17.39%	14.65%	18.55%	15.90%
Electricity, gas, heat supply and water	1.32%	0.96%	0.43%	0.63%
Information and communications	1.22%	3.15%	2.13%	2.14%
Transport and postal activities	5.34%	5.98%	5.45%	6.09%
Whole sale trade and retail trade	13.67%	16.32%	16.90%	15.87%
Finance and insurance	1.45%	2.50%	1.65%	2.40%
Real estate, and goods rental and leasing	1.08%	0.77%	1.10%	1.40%
Research and development, and professional and technical services	1.55%	2.83%	3.05%	2.92%
Accommodations, eating and drinking services	4.02%	6.11%	7.14%	5.09%
Living-related and personal and amusement services	2.57%	4.63%	4.15%	3.96%
Education and learning support	2.87%	4.69%	4.59%	4.41%
Medical services and social welfare	9.39%	13.88%	10.07%	10.87%
Compound services	1.45%	0.59%	0.57%	1.07%

Miscellaneous services	9.49%	4.76%	5.33%	6.07%
Government	4.05%	3.41%	1.81%	4.18%
Industries unable to classify	2.53%	3.02%	3.23%	2.69%

Notes: The sample covered here is the working age population (15 to 64 years old) in the labor force (employed or unemployed) who were living in either Aomori, Iwate, Miyagi, Fukushima, Ibaraki, or Chiba at the time of the earthquake. Since the industry categories are written in only Japanese in the codebook, we referred to the translation by Osaka University (http://www.osaka-u.ac.jp/ja/guide/career/document/files/sangyo_bunrui_en.pdf, accessed on March 24, 2017)). However, we slightly changed some industry names because the categories listed by Osaka University are more detailed and not exactly the same as ours.

6. Results

In this section, we present the results of the estimated impact of the Great East Japan Earthquake on labor market outcomes (employment status and earnings) for evacuees and non-evacuees.

6.1 Effect of Evacuation Status and Other Characteristics on Unemployment

Table 4 shows the results of the probit estimation of the probability of being unemployed and employed by evacuation status. As shown in Table 4, compared with non-evacuees, those who evacuated and were still away from home have a 4.5% higher chance to be unemployment status. Similarly, those who evacuated and moved have a 3.4% points higher chance to be unemployed than non-evacuees. Further, compared with men, women have a 3.7% points higher chance to be unemployed. If they are married, they have a 3.2% points lower probability to be unemployed. Finally, Table 4 shows that the higher their educational backgrounds are, the lower their probabilities to be unemployed are.

Table 4: Probit Regression Estimating Unemployment by Evacuee Status, Marginal Effects

Dependent variable: Unemployed=1, Employed=0			
	Marginal Effects	Standard Errors	P>z
Away	0.045***	0.010	0.000
Moved	0.034***	0.013	0.007
Returned	0.003	0.005	0.552
Female	0.037***	0.002	0.000
Age	-0.002***	0.001	0.000
Age squared	0.000***	0.000	0.002

Married	-0.032***	0.003	0.000
Number of children under 15 years	0.002	0.001	0.102
Senior high	-0.019***	0.003	0.000
Post secondary vocational education and training	-0.029***	0.004	0.000
Junior college	-0.025***	0.003	0.000
College	-0.030***	0.003	0.000
Graduate school	-0.038***	0.004	0.000
Number of obs	134,189		
LR chi2(33)	1124.86		
Prob > chi2	0.0000		
Pseudo R2	0.0401		

Notes: *** means significant at 1% level, ** significant at 5% level, and * significant at 10% level. The sample covered here is the working age population (15 to 64 years old) in the labor force (employed or unemployed) who were living in either Aomori, Iwate, Miyagi, Fukushima, Ibaraki, or Chiba at the time of the earthquake. The sample here also excludes those who are going to school.

Finally, Table 5 shows the impact of evacuation status on employment status estimated by PSM on observable characteristics. We show results of both average treatment effect on the treated (ATET) and average treatment effect (ATE). The ATET results of those still away and moved do not significantly differ from the results in previous models; however, the estimated effects of being away and moved are greater than that in the baseline probit model. In addition, we now find a statistically significant negative (estimated) impact of “evacuated and returned home” on employment after controlling for selection into this category on observable characteristics, although the estimated effect for this group is still the weakest. As we can see in Table 5, those still away have higher probability to be unemployed by 5.4% points, those moved have higher probability to be unemployed by 4.3% points and those returned home have higher probability to be unemployed by 0.9% points than those did not evacuate. On the other hand, in the ATE estimation, the effect of being away on the probability of unemployment get much smaller and statistically insignificant and the one of having returned home on the probability of unemployment decreases, while the result of those who have moved does not change much from the ATET result.

Table 5: Propensity Score Matching: The Probability of Being Unemployed Among Those Who Evacuated Compared With Those Who Did Not

Dependent Variable: Unemployed=1, 0 otherwise	Away	Moved	Returned
Evacuated and Still Away, Moved or Returned,	0.051***	0.043***	0.009***
Average Treatment Effect on the Treated	(0.006)	(0.009)	(0.004)
Number of observations	126,257	124,642	129,411
Evacuated and Still Away, Moved or Returned,	0.0007	0.053***	-0.019***
Average Treatment Effect	(0.002)	(0.009)	(0.002)
Number of observations	107,613	124,642	129,411

Notes: *** means significant at 1% level, ** significant at 5% level, and * significant at 10% level. Standard errors here are AI Robust Standard Errors. The balancing tests for propensity score matching estimation were also conducted and we confirmed the balancing property is satisfied. Results of the balancing test are shown in the appendix.

In addition to estimation for six affected prefectures, we also conducted PSM for those who lived in five affected prefectures, excluding Fukushima. Because the situation for those who are from Fukushima is very different because of the accident of Fukushima Daiichi nuclear plant. Table 6 shows the impact of evacuation status on employment status estimated by PSM on observable characteristics for people from Aomori, Iwate, Miyagi, Ibaraki, and Chiba. Again, we show results of both average treatment effect on the treated (ATET) and average treatment effect (ATE). Both ATET and ATE results are similar here. Those who moved have the highest probability of being unemployed and followed by those who are still away. Those who still away have higher probability to be unemployed by 2.3% points for ATET and by 1.9% points for ATE compared to those who did not evacuate, while those who moved have higher probability to be unemployed by 5% points for ATET and by 9% points for ATE than those who did not evacuate. Those who returned home tend to have smaller chance to be unemployed for both ATET and ATE but this is not statistically significant.

Table 6: Propensity Score Matching: The Probability of Being Unemployed Among Those Who Evacuated Compared With Those Who Did Not, Without Those Who Lived in Fukushima

Dependent Variable: Unemployed=1, 0 otherwise	Away	Moved	Returned
	0.023***	0.050***	-0.005

Evacuated and Still Away, Moved or Returned, Average Treatment Effect on the Treated	0.007	0.011	0.005
Number of observations	108,127	107,454	109,417
Evacuated and Still Away, Moved or Returned, Average Treatment Effect	0.019*** (0.001)	0.090*** (0.007)	-0.011 (0.003)
Number of observations	89,483	107,454	109,417

Notes: *** means significant at 1% level, ** significant at 5% level, and * significant at 10% level. Standard errors here are AI Robust Standard Errors. The balancing tests for propensity score matching estimation were also conducted and we confirmed the balancing property is satisfied. Results of the balancing test can be provided upon request.

6.2 Effect of Evacuation Status and Other Characteristics on Earnings

Table 7 presents the result of the ordinary least squares regression of the impact of evacuation status on earnings. It shows that compared with non-evacuees, annual earnings among those who evacuated and still away from home are lower by 14.6% compared to those who did not evacuate. Also, those who evacuated and returned home have lower annual earnings compared with those did not evacuate by 4.0%. In contrast, annual earnings are not statistically significantly different among those who evacuated and moved compared with non-evacuees. These findings imply that the labor market situation is worse for those who are still away from home. The results for the other individual attributes including educational background were as expected.

Table 7: Ordinary Least Squares Regression: The Impact of Evacuation Status and Individual Characteristics on Log of Earnings

Dependent variable: Log of Earnings			
	Coefficient	Standard Error	P>z
Away	-0.146***	0.026	0.000
Moved	-0.007	0.031	0.826
Returnee	-0.040**	0.016	0.015
Female	-0.776***	0.008	0.000
Experience	0.033***	0.001	0.000
Experience squared	-0.001***	0.000	0.000
Married	0.068***	0.009	0.000
Number of children under 15 years	-0.008**	0.004	0.050

Senior high	0.209***	0.016	0.000
Post secondary vocational education and training	0.368***	0.020	0.000
Junior college	0.316***	0.021	0.000
College	0.544***	0.019	0.000
Graduate school	0.836***	0.029	0.000
Number of obs	125,190		
R-squared	0.3863		

Notes: *** means significant at 1% level, ** significant at 5% level, and * significant at 10% level. The sample covered here is the working age population (15 to 64 years old) in the labor force (employed or unemployed) with earnings information who were living in either Aomori, Iwate, Miyagi, Fukushima, Ibaraki, or Chiba at the time of the earthquake. The sample here also excludes those who are going to school. Industry dummies are included as independent variables in the estimation but the results are not shown here for brevity.

Next, Table 8 shows the impact of evacuation status on annual earnings estimated by PSM on observable characteristics. Again we show the results of both average treatment effect on the treated (ATET) and average treatment effect (ATE). Both ATET and ATE results are somewhat different from the results in the OLS model. According to the ATET results in Table 10, those still away have lower annual earnings by 10.6%, those moved have lower annual earnings by 17.1% points, those returned home have lower annual earnings by 10.3%, than those did not evacuate. On the other hand, in the ATE estimation, the effect of being away and moved get smaller and the effect of having returned to home get statistically insignificant. Looking at the results of both ATET and ATE, we can say that those who evacuated, especially those still away from home and those who moved, tend to have less annual earnings compared to those who did not evacuate.

Table 8: Propensity Score Matching: Earnings of Those Who Evacuated Compared With Those Who Did Not

Dependent Variable: Log Annual Earnings	Away	Moved	Returned
Average Treatment Effect on the Treated	-0.106***	-0.171***	-0.103***
	(0.017)	(0.009)	(0.020)
Number of observations	100,471	83,580	100,250
Average Treatment Effect	-0.073***	-0.039**	-0.005
	(0.007)	(0.018)	(0.011)

Number of observations	100,471	116,357	120,848

Notes: *** means significant at 1% level, ** significant at 5% level, and * significant at 10% level. Standard errors here are AI Robust Standard Errors. The balancing tests for propensity score matching estimation were also conducted and we confirmed the balancing property is satisfied. Results of the balancing test are shown in the appendix.

As same as the estimation on unemployment, we also conducted PSM for those who lived in five affected prefectures, excluding Fukushima. Table 11 shows the impact of evacuation status on annual earnings estimated by PSM on observable characteristics for people from Aomori, Iwate, Miyagi, Fukushima, Ibaraki, and Chiba. We show results of both average treatment effect on the treated (ATET) and average treatment effect (ATE). Both ATET and ATE results show that those who are still away from home have the lowest annual earnings. For those who moved, the coefficient is statistically insignificant for ATET but statistically significant and shows that their annual earnings are lower by 10.3% than those who did not evacuate for ATE. For those who returned home, the coefficients of both ATET and ATE are not statistically significant.

Table 9: Propensity Score Matching: Earnings of Those Who Evacuated Compared With Those Who Did Not (Excluding Those Who Lived in Fukushima)

Dependent Variable Unemployed=1, 0 otherwise	Away	Moved	Returned
Evacuated and Still Away, Moved or Returned, Average Treatment Effect on the Treated	-0.143***	0.013	-0.012
	(0.023)	(0.026)	(0.017)
Number of observations	100,907	100,250	102,145
Evacuated and Still Away, Moved or Returned, Average Treatment Effect	-0.171***	-0.103***	0.003
	(0.009)	(0.020)	(0.013)
Number of observations	83,580	100,250	102,145

Notes: *** means significant at 1% level, ** significant at 5% level, and * significant at 10% level. Standard errors here are AI Robust Standard Errors. The balancing tests for propensity score matching estimation were also conducted and we confirmed the balancing property is satisfied. Results of the balancing test can be provided upon request.

6.3 Summary, Discussion and Policy Implications

In summary, our findings show that those who evacuated and still away from home and moved to another place tend to have the worst labor market performance in terms of unemployment across different PSM models. For most of PSM models including PSM-ATE models which are thought to have least unbiased estimates, those who moved to another place has the highest probability of unemployment. On the other hand, those still away from home have the worst labor market performance in terms of annual earnings, followed by those who moved to another place. This is understandable because it is hard to live in temporary houses or new places and they might find it difficult to access the most suitable information of the local labor market conditions look for a job in an unfamiliar city without knowing many people there. In fact, previous literature suggest network has a positive effect on labor market performance (Montgomery, 1991) and these network effects get stronger in migrant communities (Borjas, 1992; Munshi, 2003).

The results of our study imply that those who are still away from home and moved to another place have the worst labor market situations in terms of employment and earnings in general. We could possibly create programs to support evacuees, especially those who are away from home and those who moved in addition to existing employment support for affected people and prefectures so that they can find jobs or better jobs which match for their qualifications. The important thing is that we need to support those who are living outside of affected prefectures as well. We need further investigations on the details of the situation of those who evacuated to form concrete programs.

7. Conclusion

This study analyzed the impact on the labor market outcomes of evacuees of the Great East Japan Earthquake by using annual microdata from the 2012 ESS in Japan. We estimated the effects not only on the employment status of evacuees but also on their earnings. Our estimates suggest that those still away from home and those who moved tend to have the worst labor market performance in terms of employment and earnings. However, further studies are required to investigate the reasons for our findings, such as how education level affects the employment and earnings of those who evacuated after the earthquake. We would also like to note that improved identification strategies are necessary because PSM could not control for selection into evacuation status based on unobserved characteristics. Also, PSM used in this paper could only compare two groups not more than two groups. In addition, we need to find a way in which to estimate the effect of evacuation status on employment and earnings taking into account the multinomial categories of evacuation status.

The results suggest that we need more employment support for those who are away from home including people those who are living outside of affected prefectures. We need further investigation on evacuees to formulate a more concrete employment support program.

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Appendix

Table A1 PSM Balancing Test (Away vs. Did not evacuate), Effects on Unemployment

	Mean	**t-test**	**V(T)/**		
Variable	**Treated**	**Control**	**%bias**	**t**	**p>t**
Female	0.419	0.422	-0.2	-0.08	0.940
Age	44.63	45.00	-3.2	-1.23	0.217
Age squared	2141	2173	-3.4	-1.32	0.228
Married	0.621	0.622	0.3	-0.13	0.899
Number of children under 15 years	0.498	0.468	3.5	1.44	0.150
Senior high	0.648	0.654	-1.3	-0.54	0.586
Post secondary vocational education and training	0.056	0.046	3.7	1.69	0.092
Junior college	0.059	0.067	-3.0	-1.27	0.204
College	0.080	0.078	0.5	0.28	0.783
Graduate school	0.002	0.002	0.0	-0.00	1.000
The prefecture when a respondent had an earthquake					
Aomori	0	0	0.0		
Iwate	0.240	0.236	0.9	0.32	0.750
Miyagi	0.306	0.311	-1.1	-0.40	0.688
Fukushima	0.436	0.435	0.3	0.10	0.921
Ibaraki	0.007	0.007	0.0	0.00	1.000
Chiba	0.011	0.011	0.0	0.00	1.000

Notes: We conducted balancing tests using psmatch2. This balancing test is for the average treatment effect on the treated. The balancing test for the average treatment effect and the estimation excluding Fukushima can be provided upon request.

Table A2 PSM Balancing Test (Moved vs. Did not evacuate), Effects on Unemployment

	Mean	t-test	V(T)/		
Variable	**Treated**	**Control**	**%bias**	**t**	**p>t**
Female	0.454	0.459	-1.0	-0.28	0.78
Age	37.67	37.73	-0.5	-0.14	0.888
Age squared	1552	1539	-0.6	-0.2	0.843
Married	0.597	0.579	3.6	1.02	0.306
Number of children under 15 years	0.664	0.652	1.3	0.37	0.711
Senior high	0.480	0.501	-4.4	-1.25	0.211
Post secondary vocational education and training	0.119	0.112	-2.4	0.65	0.514
Junior college	0.071	0.065	2.5	0.76	0.448
College	0.232	0.237	-1.0	-0.29	0.774
Graduate school	0.039	0.037	0.7	0.18	0.856
The prefecture when a respondent had an earthquake					
Aomori	0.022	0.024	-0.4	-0.23	0.817
Iwate	0.098	0.099	-0.4	-0.12	0.907
Miyagi	0.446	0.463	-3.9	-0.98	0.329
Fukushima	0.293	0.279	3.6	0.92	0.356
Ibaraki	0.091	0.089	0.4	0.12	0.903
Chiba	0.050	0.046	1.1	0.49	0.627

Notes: We conducted balancing tests using psmatch2. This balancing test is for the average treatment effect on the treated. The balancing test for the average treatment effect and the estimation excluding Fukushima can be provided upon request.

Table A3 PSM Balancing Test(Returned vs. Did not evacuate), Effects on Unemployment

	Mean	**t-test**	**V(T)/**		
Variable	**Treated**	**Control**	**%bias**	**t**	**p>t**
Female	0.479	0.476	0.6	0.34	0.737
Age	42.27	42.40	-1.1	-0.6	0.55
Age squared	1933	1943	-1	-0.55	0.583
Married	0.682	0.690	-1.6	-0.91	0.362
Number of children under 15 years	0.715	0.725	-1	-0.54	0.586
Senior high	0.573	0.585	-2.5	-1.41	0.158
Post secondary vocational education and training	0.078	0.078	0.1	0.07	0.948
Junior college	0.083	0.082	0.1	0.03	0.974
College	0.160	0.155	1.1	0.65	0.513
Graduate school	0.014	0.012	2.3	1.41	0.16
The prefecture when a respondent had an earthquake					
Aomori	0.036	0.035	0.3	0.28	0.776
Iwate	0.063	0.062	0.2	0.15	0.884
Miyagi	0.261	0.257	0.9	0.46	0.643
Fukushima	0.512	0.515	-0.5	-0.26	0.791
Ibaraki	0.085	0.088	-1	-0.66	0.51
Chiba	0.042	0.042	0.1	0.13	0.895

Notes: We conducted balancing tests using psmatch2. This balancing test is for the average treatment effect on the treated. The balancing test for the average treatment effect and the estimation excluding Fukushima can be provided upon request.

Table A4 PSM Balancing Test (Away vs. Did not evacuate), Effects on Earnings

	Mean	**t-test**	**V(T)/**		
Variable	**Treated**	**Control**	**%bias**	**t**	**p>t**
Female	0.404	0.413	-1.9	-0.72	0.471
Age	44.84	45.23	-3.2	-1.22	0.222
Age squared	2157	2194	-3.5	-1.31	0.192
Married	0.636	0.622	2.9	1.09	0.278
Number of children under 15 years	0.505	0.461	5.1	1.97	0.049
Senior high	0.655	0.673	-3.8	-1.5	0.134
Post secondary vocational education and training	0.062	0.052	3.9	1.64	0.101
Junior college	0.054	0.052	0.8	0.35	0.726
College	0.085	0.086	-0.2	-0.09	0.925
Graduate school	0.003	0.001	1.5	1.16	0.248
The prefecture when a respondent had an earthquake					
Aomori	0	0	0	.	.
Iwate	0.252	0.247	1.1	0.39	0.694
Miyagi	0.309	0.319	-2.2	-0.76	0.446
Fukushima	0.420	0.415	1.1	0.37	0.71
Ibaraki	0.008	0.008	0	0	1
Chiba	0.011	0.011	0	0	1

Notes: We conducted balancing tests using psmatch2. This balancing test is for the average treatment effect on the treated. The balancing test for the average treatment effect can be provided upon request.

Table A5 PSM Balancing Test (Moved vs. Did not evacuate), Effects on Earnings

	Mean	**t-test**	**V(T)/**		
Variable	**Treated**	**Control**	**%bias**	**t**	**p>t**
Female	0.427	0.428	-0.1	-0.04	0.97
Age	37.43	37.809	-3.3	-0.89	0.373
Age squared	1534	1569	-3.5	-0.99	0.32
Married	0.598	0.590	1.7	0.45	0.652
Number of children under 15 years	0.650	0.615	3.9	1.03	0.301
Senior high	0.464	0.486	-4.4	-1.18	0.237
Post secondary vocational education and training	0.128	0.126	0.7	0.17	0.868
Junior college	0.069	0.058	4.2	1.21	0.226
College	0.240	0.243	-0.7	-0.17	0.863
Graduate school	0.038	0.038	0	0	1
The prefecture when a respondent had an earthquake					
Aomori	0.017	0.020	-1	-0.55	0.583
Iwate	0.105	0.098	2.1	0.61	0.541
Miyagi	0.439	0.469	-7.1	-1.67	0.095
Fukushima	0.297	0.280	4.2	1.02	0.309
Ibaraki	0.089	0.084	1.4	0.46	0.645
Chiba	0.053	0.048	1.4	0.59	0.556

Notes: We conducted balancing tests using psmatch2. This balancing test is for the average treatment effect on the treated. The balancing test for the average treatment effect can be provided upon request.

Table A6 PSM Balancing Test(Returned vs. Did not evacuate), Effects on Earnings

	Mean	**t-test**	**V(T)/**		
Variable	**Treated**	**Control**	**%bias**	**t**	**p>t**
Female	0.468	0.470	-0.5	-0.26	0.797
Age	42.24	42.47	-2	-1.09	0.277
Age squared	1929	1947	-1.7	-0.96	0.336
Married	0.688	0.689	-0.4	-0.2	0.843
Number of children under 15 years	0.725	0.745	-2.1	-1.07	0.285
Senior high	0.575	0.591	-3.3	-1.8	0.072
Post secondary vocational education and training	0.079	0.083	-1.4	-0.74	0.46
Junior college	0.084	0.079	1.8	1	0.316
College	0.160	0.152	2	1.14	0.256
Graduate school	0.015	0.011	2.9	1.69	0.092
The prefecture when a respondent had an earthquake					
Aomori	0.037	0.036	0.1	0.1	0.922
Iwate	0.065	0.066	-0.4	-0.3	0.767
Miyagi	0.260	0.256	1.1	0.57	0.572
Fukushima	0.509	0.512	-0.7	-0.35	0.728
Ibaraki	0.086	0.088	-0.8	-0.49	0.626
Chiba	0.044	0.042	0.6	0.59	0.556

Notes: We conducted balancing tests using psmatch2. This balancing test is for the average treatment effect on the treated. The balancing test for the average treatment effect can be provided upon request.