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Analysis of the Survey Response Behavior: An experience from a pilot survey of the health and living status of the 50s and beyond in Japan*

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Abstract

Exploiting a survey of aged population implemented in Tokyo, we examine the targeted individual's decision to respond to the survey. The sampling of potential respondents is based on the resident registry compiled by the local governments that carries all targeted individuals' information on sex, age and exact street address. We matched this data with the land price of the street address and the survey administrative information that records interviewer's information. Our empirical findings reveal that whether a targeted individual responds to the survey or not depends on age, gender and land price. Most significantly the decision critically depends on interviewers' unobserved heterogeneity. We speculate that the interviewer's efforts to obtain responses crucially determine whether the targeted individual responds to the survey. Given the random assignment of interviewers to the targeted individuals, we argue that interviewers' heterogeneity can be used as an excluded variable for the Heckman sample selection correction.

JEL Classification Code; C42, C81

Key words: response rate, survey data, sample selection bias, survey of the health and living status of the 50s and beyond

1. Introduction

For a survey to be deemed credible by domestic and international academicians and policy makers alike, high response rate is critical. Yet the survey response is generally declining in Japan especially around the time the new law came into force in May 2003. The law itself only provides the general rules private and public sectors adhere to when dealing with the individual private information but the discussion surrounding the Private Information Protection Law promoted a wrong prevailing perception of people towards a survey; private information should be closed for *any* purposes. As a result, recent surveys suffer from a low response rate since most of people mistakenly believed that they should reject a survey even for a proper purpose. The Census Survey which is compulsory and enjoyed a very high response rate, suffered from a lower response rate in 2005, which in turn brought about the pessimism for performing a survey.

Thus, survey performers in Japan are now experiencing a great difficulty and in most cases, obtain lower response rates and little credibility from researchers, especially experts of empirical studies. Moreover, the negative attitudes of the general public towards the surveys also bring about serious consequences for policy makers since policy makers cannot perform "evidence-based policy making" even though a tremendous volume of policy issues which need empirical evaluation have been unexplored. What is worse is that it takes a long time to correct the misperception once it has prevailed.

One of the serious consequences of low response rate is that the inference based on the sample may not represent the tendency or causal relationship in the population.

The sample selection bias in the causal relationship estimation occurs when those who respond and who do not respond are different in the unobserved characteristics. Thus, to learn the degree of the sample selection bias due to the low response rate, it is important to learn who tend to respond and who tend not to respond. However, it is generally difficult to learn the characteristics of individuals who do not respond because the characteristics of individuals are first revealed through the survey response in a general setting.

This paper takes advantage of the pilot study for the Japanese version of HRS (Health and Retirement Study) to provide evidences on the determinants of the response rate in order to caliber the degree of potential sample selection bias. The HRS is performed by the Survey Research Center at the University of Michigan and a representative panel data set for those aged 50 and above. Under the rapid speed of aging and an increased importance towards more effective social security policy, some resembling large surveys are implemented in Europe such as ELSA (English Longitudinal Study of Ageing) in the U.K. and SHARE (Survey of Health, Ageing and Retirement in Europe) in continental European countries. Those surveys are enjoying a higher response rate of 50 percent and more in most cases. In contrast, this is not the case for the pilot study performed by Research Institute of Economy, Trade and Industry (RIETI) in 2005.

The notable merit of the pilot survey is that information is available for who are contacted by the interviewer or absent and who accepted or rejected as well as their reasons to accept or reject, together with some demographic variables including age, gender and street address. This information including those who do not respondent to the

survey allows us to examine the determinant of the survey compliance and to infer the possible sample selection bias. Despite that most of surveys suffer from lower response rates currently in Japan, to our best knowledge, there have been little scientific efforts to analyze what accounts for the survey response.

We observe a large variation in response rates across individuals. The analysis results show that the response rate is higher among elder people for male sample; while it is lower among elder people for female sample. The tendency for male could be interpreted as the difficulty to obtain responses from working people. Observed characteristics of interviewers are not significant determinant for the response rate, however, the comparison of the estimation results for the models that does not allow for interviewers' heterogeneity and the one allows for it reveal the importance of interviewers' heterogeneity as the determinant of response rate. We suggest a possibility that the interviewers' heterogeneity in the ability or effort to obtain responses can be used as an excluded variable in the Heckman style sample selection correction model.

This paper proceeds as follows. The next section describes the data set we used in this study. The third section, the main part of this study, performs regression analysis for what factors explain the response rate. The final section concludes and suggests the possible extension of the study.

2. Data description

The data set examined in this study is micro-level data from the pilot study of Japanese version of HRS (Health and Retirement Study)[1]. The pilot study consists of the two waves. The first wave took place for 700 persons in Ohta-ku during November, 2005 to January, 2006 and the second wave took place for 1,500 persons in Ohta-ku and Adachi-ku during February and March in 2006.

For the first pilot study, 35 locations within Ohta-ku were chosen to cover the whole area and for each location 20 individuals between 50 and 84 are randomly chosen from the household registration. For the second pilot study in Ohta-ku the same locations used in the first pilot study were used in order to facilitate comparison between the two pilot studies. This time 20 individuals between 50 and 75 are randomly chosen from the registry. The target age group was changed because individuals beyond 75 are harder to locate at the addresses given in the registry although the response rate among them are higher than the average response rate once located as discussed below. In order to avoid re-sampling the same persons, the street address was shifted by a few digits. For Adachi-ku, 38 locations are chosen to cover the whole area and sampling was done analogously to the Ohta-ku just discussed.

The first version of the questionnaire was developed based on the SHARE (Survey on Health, Aging and Retirement in Europe) questionnaire. The questionnaire consisted of the two parts; mail (drop-off) questionnaire and interview. The first version was tested on 8 individuals and based on the experience it was modified before the first pilot

[1] See the details of the questionnaire for Abe, Ichimura, Kawaguchi, Kondo, Sawada, Shimizutani, Noguchi and Hashimoto (2006).

study. After the modification, the questionnaire for interview was expected to take 1 hour and a half to 2 hours and a half to complete depending on the health experience of the individual. We have hired a private company to carry out the survey. We held three meetings to explain why the survey was necessary for properly designing the social policies and also to explain the questionnaire. After the first pilot study, we reviewed the consequences with some interviewers and decided to revise the questionnaire substantially. Before the second pilot study, the questionnaire was substantially reduced and the interview survey was divided into two parts to diminish the burden to interviewees. The first half was expected to take about 30 minutes and if a interviewee agrees to continue the interview, another 30 minutes were spent for the second half of the interview.

The survey proceeds as follows. First, the RIETI sent mails to each person in the sample to notify that he/she was randomly chosen based on the household registration and an interviewer would visit at the address in near future. Second, after several days, an interviewer actually visits each address to contact the person. Even though an interview cannot meet the respondent for the first time, he/she visited at the same address for several times by changing the timing. Third, when an interviewer succeeded in contacting a person in the sample, the interviewer checked the receipt of the letter from RIETI and explained the purpose of the survey, protection of private information and made efforts to receive the agreement to comply the mail and interview survey. Once a person in the sample agrees to be interviewed, the interviewer asked him/her to fill out the form of the self-reported questionnaire and made an appointment of the interview. Exceptionally, if the interviewee agrees with interview immediately, the mail

questionnaire would be fill out later and mailed to the survey company. On the day of the interview, an interviewer performed the first half of the interview questionnaire, which was expected to take 30 minutes. After the first half, the interviewer tried to obtain an agreement to continue the remaining half, which required another 30 minutes[2].

Table 1 tabulates the response rate by sexes. The response rate for written survey that were dropped off before the interview was around 35% while the response rate for the first half of the interview is around 32%. For the second half of the survey, the response rate is further dropped by 4 percentage points. The response rate is generally higher among female.

3. Analysis of survey responses

We attempt to explain the individual's decision whether one complies with the survey. The targeted individuals are given choices to comply or not to comply with the survey. We assume that the targeted individuals comply with the survey when the benefit of compliance exceeds the cost. The benefits of compliance to the survey are both psychic and pecuniary. Because we very much emphasized the importance of the compliance to the survey for the success of the survey and it accordingly improve the design of policies such as social security policies when the interviewer ask for cooperation. We also compensate compliers by uniform payment that is almost equivalent to about twice of the average hourly rate of pay for male workers. Because

[2] Unlike HRS/ELSA/SHARE, this survey was not computer-aided, which required more minutes to finish the survey.

the survey takes about two hours, this pecuniary benefit presumably covers the opportunity cost.

The cost of complying with the survey is also both psychic and pecuniary. Some of the survey questions are quite intrusive such as questions regarding to income or asset. Thus there is presumably non negligible degree of psychic cost for respondents to comply. In addition, Japanese people generally do not have custom to have guests at home and having interviewer at home may create additional cost. These psychic costs may be higher among less wealthily people because they may not want to reveal their low income or poor residential situation. Lastly, the pecuniary cost of compliance is the opportunity cost or the value of leisure, which is wage rate at the margin, if we take neoclassical labor supply theory seriously. This opportunity cost varies significantly across individuals due to the heterogeneity in the wage rate.

Based on the theoretical background above, we model individual decision to comply with the survey as following.

$$Response_i = \beta_0 + \beta_1\, landprice_{200\text{-}i} + \beta_2\, landprice_{200+i} + \beta_3\, age\ 58\text{-}63_i + \beta_4\, age\ 64\text{-}_i + interviewer\ characteristics_j\ \beta_5 + \beta_6\, survey\ order_i + u_{ij}$$

The right hand side is the dummy variable whether the individual i responds to the survey. Lnadprice 200- is the land price below 200 thousands yen per square meter. Lnadprice 200+ is the land price above 200 thousands yen per square meter. The distribution of land price is shown in Figure 1. This non-linear specification is based on the observation that the response rate reaches at its peak around 200 thousands yen per square meters as shown in Figure 2. The dummy variable Age 58-63 takes one if the respondent's age is between 58 and 63 and the similar for Age 64-. The vector

interviewer characteristics is a set of variables that represent the characteristics of interviewer j that takes contact with the targeted individual i. This vector includes interviewers' years of education, age, its squared, experience, its squared, the log of the number of interview experience last five years. The survey order takes one if the target individual is contacted in the first half of the interviewer experience and takes two if it is contacted in the second half.

The models are separately estimated for males and females. The estimation results are tabulated in Table 3. Columns (1) to (3) are the results for males for each part of the survey: written, first half interview, and second half interview. The results are generally identical across columns. Regarding to the land price, those who live in the street address with higher land price are more likely to respond until the land price reaches 200 thousands yen per square meter. Once the land price hit this value, the land price does not significantly affect the response rate. Those who are age between 58 and 63 are about 10 percentage points higher response rate than those age below 58. In addition, those who are age above 63 have about 15 points higher response rate. Among males, more aged are more likely to respond to the survey. This is understandable because those younger males are more likely to work and accordingly have higher opportunity cost. Thus among younger respondents, the employment rate may be underestimated because this sample selection could be serious. Neither interviewer observable characteristics nor survey order affect the response rate.

As for the results for female, the effect of land price on response rate is similar to the findings for male. The response rate increases until the land price of 200 thousands per square meters, and above that point, the land price does not affect the response rate.

Contrary to the results for males, the response rate of relatively aged people is not necessarily higher than relatively younger people. For written survey and the first half of the interview, those ages between 58 and 63 are even 13 or 14 percentage points less likely to respond to the survey than those ages between 50 and 57. The contrast to the results for male can be explained by the relatively uniform employment rate among female across age groups. The opportunity cost of responding to the survey is presumably uniform across age groups. Similar to the results for male, neither interviewer characteristics nor the survey order affect the response rate.

The results so far indicate that interviewers' characteristics do not affect the targets' behavior whether they respond to the survey or not. However, through follow up conversation with interviewers, we perceive strong heterogeneity across interviewers. For example, an interviewer purchased gift pens to express her appreciation for survey compliers. The other interviewer attempt to take contact with the target by varying time to visit and leave Post-It memos to indicate she was there. We were persuaded that these small ideas and efforts may well result in the difference in the response rate across interviewers. This heterogeneity in interviewers' ability or effort to obtain responses is less likely to be captured by the observed characteristics. Also higher unobserved ability or effort may have stronger effects for targets from whom responses are difficult to obtain. We model this interviewers' heterogeneity by the following model:

$$Response_i = \beta_{0j} + \beta_{1j}\, landprice_{200\text{-}i} + \beta_{2j}\, landprice_{200+i} + \beta_{3j}\, age\ 58\text{-}63_i + \beta_{4j}\, age\ 64\text{-}_i + interviewer\ characteristics_j\ \beta_{5j} + \beta_{6j}\, survey\ order_i + u_{ij}\,.$$

Parameters for each interviewer were estimated by OLS applied for the sample of each interviewer. After estimating the coefficients for each interviewer, we summarized the results by calculating weighted average of the estimates and the asymptotic standard errors according to the following formula:

$$\bar{\hat{\beta}}_j = \frac{\sum_j \{(1/Var(\hat{\beta}_j))\hat{\beta}_j\}}{\sum_j (1/Var(\hat{\beta}_j))}$$

$$Asy.S.E.(\bar{\hat{\beta}}_j) = \sqrt{\frac{1}{\sum_j (1/Var(\hat{\beta}_j))}}$$

Note that the asymptotic standard error formula is based on the assumption that coefficients are not correlated across interviewers. Because the results are similar across the types of interview, we focus on the determination of the response to the first half of the interview.

Table 4 tabulates the above weighted averages and asymptotic standard errors. Contrary to the regression results under the fixed parameter assumption, the land price does not enter the regression equation in statistically significant way. This result is interpreted as an evidence that disadvantage of targeting individuals in low land price area can be overcome by the unobserved ability or effort of interviewers. While the effect of interviewers' heterogeneity is strong enough to nullify the effect of the land price, the effect of age on response rate gets stronger by allowing for the heterogeneity. For male, older people are more likely to respond, while for female, younger people are more likely

to respond. This result implies that better interviewers' response rate is significantly dependent on the underlying structure of the targets' heterogeneity in opportunity cost. This result is understandable because better interviewers are less subject to "noise" and more strictly restricted by the underlying structure.

The difference in the results for fixed and random parameter models clearly indicates the importance to incorporate the interviewers' heterogeneity. This finding of the significant interviewer's heterogeneity leads us to think about the possible future extension. A typical way to correct for the sample selection bias is Heckman's sample selection correction. The application of this model is often hindered by the lack of credible excluded variables that affect selection but do not affect the outcome of the interest. Given the random assignment of interviewers to targeted individuals, the interviewers' unobserved heterogeneity can be used as excluded variables. More specifically, predicted values from the random coefficients response model can serve as the excluded variable.

Now, think about the estimation of employment rate as an example. For simplicity, consider the model without any covariate. The response probability in this setting only depends on interviewer j. The model is denoted as

$$E(emp_{ij} \mid in\ sample) = \beta_0 + f(p_j)$$

The expected value of being employed in the sample is the sum of true employment rate β_0 and the sample selection bias term. The sample selection term appears here because more eligible interviewers catch those who are difficult to get response, in other words,

those who are employed (i.e. the function f is increasing function). If the variation of p_j is not correlated with employment probability, the function $f(p_j)$ can be estimated from the data. In the current setting, this function represents the positive relationship between the interviewers' unobserved ability/effort and the employment rate. The true employment rate is estimated as:

$$\hat{\beta}_0 = \sum_{j=1}^{J} \{ \frac{\sum_{i=1}^{N_j} emp_{ij}}{N_j} - \hat{f}(\hat{p}_j) \} / J \ .$$

The calculation of this sample selection corrected employment rate and the validation of this number with the employment rate from more reliable government statistics are left for future research.

4. Conclusion

This study analyzed the survey response behavior of individuals using the pilot survey of Japanese version of Health and Retirement Survey. We sample target individuals from the resident registry of the local government that includes age, sex and the street address. The beauty of this sample design is that we know the basic demographic characteristics of targeted individuals even for those who do not respond. In addition, we added the land price of the street address and interviewers' characteristics from auxiliary data.

To analyze the individual's response behavior, we consider a simple microeconomic model of respondents' behavior in which targeted individual decides to

comply with the survey or not by comparing the benefit and the cost of it. The benefit of complying with the survey is presumably uniform across individuals but the opportunity cost of complying with the survey varies significantly due to the variability of offered wage among individuals. The opportunity cost is expected to be high among prime age males.

The regression analysis for the determination of the survey response reveals that elder males are more likely to respond to the survey than younger counterparts. This finding is consistent with the hypothesis that individuals with high opportunity cost are less likely to respond to the survey because younger males on their early 50s are mostly employed. In the fixed coefficients model, the systematic relationship between the target age and the response rate is not found in the female sample. This finding gives additional support for the opportunity cost hypothesis because females in the sample age typically do not have good job market opportunity regardless of their age except for the case of career oriented women.

Authors met two types of interviewers who scored high and low response rates after the implementation of the survey. This meeting with interviewers gave us impression that interviewer's nature or effort is a critical determinant of the survey response. To model this finding, we allow for heterogeneity of a constant and coefficients across interviewers. In this random coefficients model, the land price is no more significant determinant of the response rate but the age ranges are still important determinants of the response rate. The difference from the results of the fixed coefficients model implies the importance of interviewers' heterogeneity. Given the random assignment of interviewers across targeted individuals, the interviewers' heterogeneity

can serve as a credible excluded variable for the Heckman sample selection correction model. We briefly sketch the idea of sample selection correction using the interviewers' heterogeneity.

The government micro data that generally have higher response rate will offer the mean of variables such as employment rate for the comparable region and the value can be used as a benchmark. The degree of the sample selection bias can be calibrated based on this benchmark. Moreover, the performance of the sample selection correction suggested in this study can be examined once the benchmarks are available. The benchmarking based on a large scale government micro data is left for future research.

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Table 1: Response Rate

	Male	Female	Total
Written	34.62	36.62	35.64
Interview (First)	30.94	32.80	31.89
Interview (Second)	26.92	28.03	27.49
N	598	628	1,226

Table 2: Descriptive Statistics

	(1)	(2)
Sex	Male	Female
Land Price	248.41	250.50
(10 Thousands Yen)	(101.50)	(97.31)
58-63	0.30	0.29
	(0.46)	(0.45)
64-	0.35	0.39
	(0.48)	(0.49)
Interviewer Education	13.70	13.79
	(1.37)	(1.41)
Interviewer Age	58.13	57.81
	(7.15)	(7.26)
Interviewer Experience	15.41	14.49
	(7.54)	(7.87)
Interviewer Experience in Past 5 Years	30.03	32.30
	(54.90)	(59.27)
Survey Order	1.44	1.43
	(0.50)	(0.50)
Observations	559	594

Note: Standard deviations are reported in the parenthesis.

Table 3: Response to the Survey

	(1)	(2)	(3)	(4)	(5)	(6)
Sex	Male	Male	Male	Female	Female	Female
Interview	Written	First	Second	Written	First	Second
Land Price Below 200	0.02	0.02	0.02	0.02	0.03	0.03
(10 Thousands Yen)	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)
Land Price Above 200	-0.10	-0.05	-0.05	-0.10	-0.07	-0.08
(10 Thousands Yen)	(0.08)	(0.06)	(0.06)	(0.07)	(0.07)	(0.07)
58-63	0.09	0.11	0.10	-0.14	-0.13	-0.06
	(0.04)	(0.04)	(0.04)	(0.05)	(0.05)	(0.05)
64-	0.15	0.18	0.15	-0.06	-0.06	-0.02
	(0.05)	(0.05)	(0.04)	(0.04)	(0.05)	(0.05)
Interviewer Education	-0.04	-0.02	-0.03	-0.01	-0.01	-0.01
	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Interviewer Age	-0.00	0.02	0.04	-0.01	-0.03	-0.02
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Interviewer Age Squared	0.01	-0.01	-0.03	0.01	0.03	0.01
	(0.04)	(0.04)	(0.05)	(0.04)	(0.05)	(0.04)
Interviewer Experience	-0.02	-0.02	-0.02	0.00	0.01	0.00
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Interviewer Experience Sq	0.05	0.04	0.06	-0.02	-0.04	-0.01
	(0.04)	(0.04)	(0.05)	(0.03)	(0.03)	(0.03)
Log Interviewer Experience in Past 5 Years	-0.01	-0.00	0.01	0.01	0.01	0.02
	(0.02)	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)
Survey Order	-0.03	-0.02	-0.02	0.02	0.03	0.03
	(0.04)	(0.04)	(0.05)	(0.04)	(0.04)	(0.04)
Constant	1.07	0.12	-0.36	0.76	1.36	0.83
	(1.58)	(1.53)	(1.66)	(1.57)	(1.73)	(1.59)
Observations	559	559	559	594	594	594
R-squared	0.04	0.05	0.05	0.02	0.03	0.02

Note: Standard errors that are robust against interviewer clustering are reported in the parenthesis.

Table 4: Random Coefficients Estimation

	(1)	(2)
Sex	Male	Female
Interview	First	First
Land Price Below 200	0.01	0.06
(10 Thousands Yen)	(0.04)	(0.05)
Land Price Above 200	-0.02	0.002
(10 Thousands Yen)	(0.01)	(0.01)
58-63	0.09	-0.24
	(0.06)	(0.07)
64-	0.23	-0.14
	(0.06)	(0.06)
Survey Order	-0.03	0.06
	(0.06)	(0.06)
Constant	0.32	0.49
	(0.12)	(0.14)

Note: Weighted average of heterogeneous coefficients is reported. Asymptotic standard errors are reported in the parenthesis.

Figure 1: Distribution of Land Price

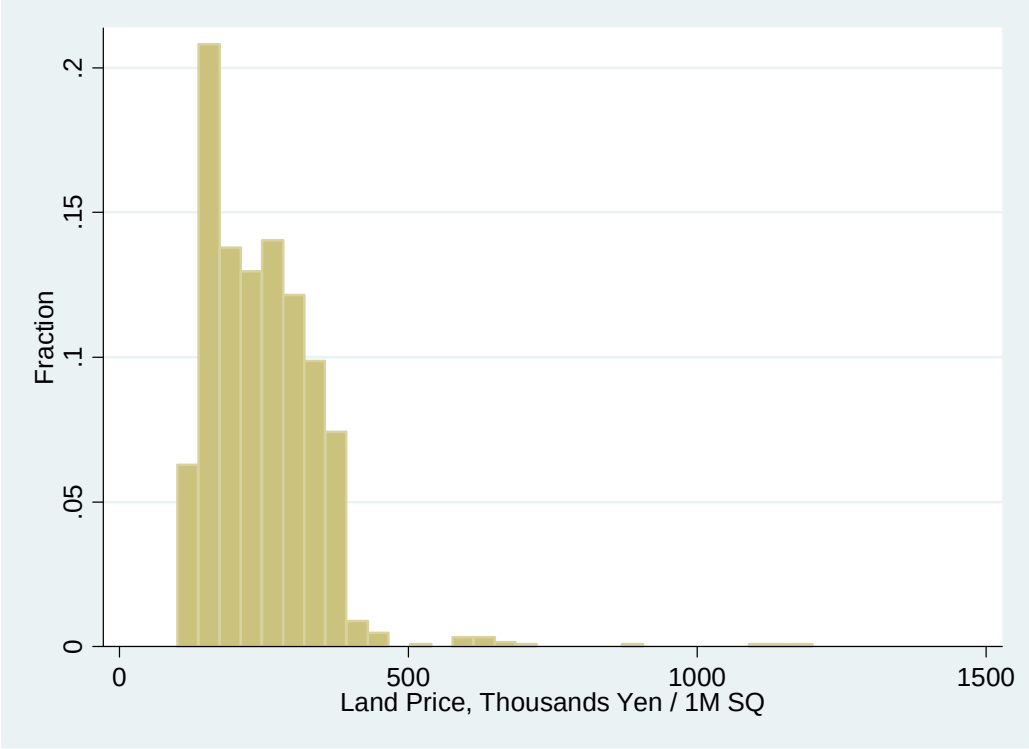

Figure 2: Simple relationship between land price and response rate

Appendix: Analysis Based on Aggregate Data

Appendix Table 1 reports the summary statistics of the response rates. The first part of the table reports the response rates across by five age cohort. The "contact" refers to the number of respondents who comply with the interview or rejected the compliance. Overall, the average "contact" ratio is about 80 percent but the rate depends on the age cohort. Naturally, it is the lower for those aged under 60 and higher for those aged 60 and above since most of people in their 50s have their job and are absent in daytime[3]. Since the survey period is short (less than two months), there are several chances of weekends to contact with them. The "Response" refers to the case that respondent complies with some part of survey. The average is about 30 percent. We note that the portion those who responded is not linear with age. While the rate exceeds 30 percent persons in their 60s, it is below 30 percent for those in their 50s and 70s. As stated in the previous section, the interview consists of two parts. The "Interview 1st" refers to respondent complies with the first part of the interview survey and the "Interview 2nd"Respondent complies with the second part of the interview survey.

The remaining parts of Appendix Table 1 show those figures by gender and region. We observe that the "contact" rate is higher for females in all age brackets than male. This is partly explained by the difference in the probability of being at home. The largest gap is observed in those aged 55-59., As regards the "response" rate, we see large discrepancy between genders especially in those in their 50s. Those figures indicate that a male person often rejects the survey because they have little time for the interview. Those trends in the "response" rate are consistent with those in the portion to comply the

[3] Note that there is not information on telephone number in the household registration. An interviewer can meet with an interviewee when visiting the address by himself.

interview. Though those aged 60 and above have little chance to reject the interview, we see the difference in the "response" rate and "interview 1st" in the 50s.

We also observe some different results between the Ota-ku and the Adachi-ku. The overall "contact" rate is slightly higher for Ota-ku and it is higher for those aged 50-54 and 70-74 in Ota-ku. The average "response" rate is also same for both cities, though the rate is much higher for people aged 55-59 in the Adachi-ku and lower for those aged 70-74. What is interesting is the wide gap in the portion to comply the interview; little gap between the "response" and "interview 1st" in the Ota-ku while much smaller portion of "interview 1st" in the Adachi-ku. The large niche is observed in those aged 50-54 and 65-69. This causes the discrepancy of the final response rate by 6 percent point. If we divide the samples into male and female, we obtain the similar observations in each city.

Based on the observations in the previous section, we devote ourselves to analyze the factors affecting the response rate. The basic specification is described as follows.

$$responsera\,te_{type,i} = a_1 + a_2 * X_i + a_3 * Y_i + a_4 * Z_i + e_i$$

where i refers to a location consisting of about 20 persons in the sample. The dependent variable takes four forms to stand for response rates. The numerators are (1) the number of the respondents who comply with the interview or rejected the compliance (contact), (2) the number of the respondents complies with some part of survey (Response), (3) the number of the respondents who comply with the first part of the interview survey (Interview 1st) and (4) the number of the respondents who comply with the second part of

the interview survey (Interview 2nd). The denominator is the number of target respondents. The explanatory variables include non-interviewee specific factors including the region dummy for the Adachi-ku and a dummy which takes one for any interviewers taking the explanation from us (X_i), dummies for age cohorts or gender (Y_i) and the interaction terms between age cohorts and gender (Z_i). The last is an error term.

Appendix Tables 2-4 report the results on the determinants of the response rates. First, we do not observe significant differences in the effect of training. The dummy for the Adachi-ku is negative and significant for the columns (2)-(4), implying that many samples in the Adachi-ku rejected the survey after contacts. The magnitudes are larger when taking interview 1st or 2nd halves as dependent variables indicate that there are many cases in the Adachi-ku that a person once agrees with the interview but rejected later. The coefficients on the age cohorts confirm the observations in the previous section. There is no significant gap between those aged 50-54 and 55-59 but the response rates are higher for those in their 60s. The response rates for those aged 60-64 and 65-69 are significantly larger. We note that the probability of response is higher for those in 65-69 by 20 percent points. What is interesting is that the relationship between the response rate and age are not linear. The rates are not statistically different between those in 50-54 and in 70 and above. Moreover, we see that the coefficients on female are positive and significant except the "contact". The marginal probability to comply the survey enhances by about 20 percent for "response" and "Interview 1st". What we pay to attention is that the positive correlation between age cohorts and response rates are not necessarily observed for female. Once controlling other factors, the response rate declined with aging especially in the "response" and "interview 1st".

Appendix Table 3 performs the similar regressions for interviewers who were participants in our explanation and Appendix Table 4 does for those who were not at the explanation. The observations we discussed above apply to the results reported in Tables 3 and 4. Given the random allocation of the interviewers to each location, insisted by the survey companies, the large difference is attributed to the fact that in most cases, the gap across age cohorts is larger for non-trained interviewer group, which demonstrates that the training for interviewers is effective to diminish heterogeneity for the response rate and contributes to a higher response[4].

[4] In contrast to the assertion of the survey companies, that the response rate is higher for non trained interviewers in those aged 50-54 might be accounted that that more experienced interviewers did not participate in our meeting for explanation and we need the reservation for the endogeneity.

Appendix Table 1: Successful Contact and Survey Compliance Rate by Age and Sex

Panel A: 2nd Round Pilot Survey, Adachi and Ota Pooled, N=1500

	Overall	50-54	55-59	60-64	65-69	70-74
All						
Contact	0.81	0.77	0.78	0.84	0.82	0.83
Response	0.29	0.28	0.25	0.32	0.35	0.23
Interview 1st	0.26	0.24	0.22	0.28	0.32	0.22
Interview 2nd	0.22	0.19	0.19	0.24	0.28	0.20
Male						
Contact	0.77	0.77	0.72	0.80	0.78	0.79
Response	0.27	0.20	0.21	0.32	0.37	0.23
Interview 1st	0.24	0.15	0.18	0.29	0.34	0.23
Interview 2nd	0.21	0.13	0.16	0.25	0.28	0.22
Female						
Contact	0.84	0.78	0.83	0.89	0.85	0.87
Response	0.31	0.38	0.29	0.31	0.33	0.22
Interview 1st	0.28	0.34	0.26	0.26	0.31	0.21
Interview 2nd	0.24	0.26	0.22	0.23	0.28	0.19

Panel B: 2nd Round Pilot Survey, Adachi Sample, N=750

	Overall	50-54	55-59	60-64	65-69	70-74
All						
Contact	0.80	0.75	0.78	0.83	0.82	0.81
Response	0.28	0.28	0.29	0.30	0.36	0.18
Interview 1st	0.23	0.19	0.23	0.23	0.30	0.18
Interview 2nd	0.19	0.17	0.19	0.20	0.24	0.16
Male						
Contact	0.77	0.73	0.71	0.78	0.85	0.77
Response	0.26	0.21	0.21	0.27	0.46	0.17
Interview 1st	0.22	0.14	0.16	0.23	0.39	0.17
Interview 2nd	0.18	0.10	0.15	0.20	0.29	0.15
Female						
Contact	0.84	0.79	0.86	0.89	0.80	0.84
Response	0.31	0.36	0.37	0.34	0.29	0.20
Interview 1st	0.25	0.26	0.30	0.24	0.24	0.20
Interview 2nd	0.21	0.26	0.23	0.20	0.21	0.16

Panel C: 2nd Round Pilot Survey, Ota Sample, N=750

	Overall	50-54	55-59	60-64	65-69	70-74
All						
Contact	0.82	0.79	0.78	0.84	0.81	0.87
Response	0.29	0.29	0.21	0.33	0.34	0.29
Interview 1st	0.29	0.29	0.21	0.33	0.34	0.28
Interview 2nd	0.25	0.21	0.19	0.28	0.32	0.28
Male						
Contact	0.79	0.81	0.74	0.81	0.73	0.83
Response	0.28	0.19	0.21	0.37	0.30	0.33
Interview 1st	0.27	0.17	0.19	0.36	0.30	0.33
Interview 2nd	0.25	0.16	0.17	0.29	0.28	0.33
Female						
Contact	0.85	0.77	0.81	0.88	0.89	0.90
Response	0.31	0.41	0.22	0.29	0.38	0.26
Interview 1st	0.30	0.41	0.22	0.29	0.38	0.23
Interview 2nd	0.26	0.27	0.20	0.26	0.35	0.23

Note: The definitions of the variables are following number divided by the number of target respondents.
Contact: Number of respondents who comply with the interview or rejected the compliance.
Response: Respondent complies with some part of survey.
Interview 1st: Respondent complies with the first part of the interview survey.
Interview 2nd: Respondent complies with the second part of the interview survey.

Appendix Table 2: Determination of Contact Success and Survey Response
Dependent Variable: Success / Number of Targeted Observations
Unit of Observations: Sampling Geographical Unit * Sex * Age Groups

	(1)	(2)	(3)	(4)
	Contact	Response	Interview 1st half	Interview 2nd half
Training	0.02	0.01	-0.00	0.03
	(0.02)	(0.02)	(0.02)	(0.02)
Adachi	-0.01	-0.02	-0.07	-0.07
	(0.01)	(0.01)	(0.01)	(0.01)
Age 55-59	-0.02	0.01	0.01	0.03
	(0.02)	(0.05)	(0.05)	(0.05)
Age 60-64	0.04	0.09	0.12	0.09
	(0.02)	(0.04)	(0.05)	(0.04)
Age 65-69	0.06	0.20	0.21	0.15
	(0.04)	(0.06)	(0.06)	(0.05)
Age 70-74	0.07	0.03	0.07	0.09
	(0.01)	(0.04)	(0.04)	(0.04)
Female	0.02	0.16	0.18	0.14
	(0.04)	(0.04)	(0.04)	(0.04)
Female *Age 55-59	0.06	-0.08	-0.09	-0.07
	(0.03)	(0.04)	(0.04)	(0.04)
Female *Age 60-64	0.06	-0.15	-0.18	-0.12
	(0.04)	(0.05)	(0.05)	(0.04)
Female *Age 65-69	0.00	-0.21	-0.21	-0.12
	(0.07)	(0.07)	(0.07)	(0.05)
Female *Age 70-74	0.01	-0.16	-0.18	-0.15
	(0.05)	(0.05)	(0.05)	(0.05)
Constant	0.75	0.22	0.20	0.15
	(0.02)	(0.05)	(0.05)	(0.06)
Observations	632	632	632	632

R-squared	0.02	0.03	0.05	0.04

Note: Interviewer clustering and Heteroskedasticity robust standard errors are reported in the parenthesis.

Appendix Table 3: Determination of Contact Success and Survey Response when Interviewers attend a Training Session
Dependent Variable: Success / Number of Targeted Observations
Unit of Observations: Sampling Geographical Unit * Sex * Age Groups

	(1)	(2)	(3)	(4)
	Contact	Response	Interview 1st half	Interview 2nd half
Adachi	0.00	-0.00	-0.06	-0.04
	(0.02)	(0.01)	(0.01)	(0.01)
Age 55-59	0.00	0.02	0.03	0.04
	(0.02)	(0.06)	(0.06)	(0.06)
Age 60-64	0.07	0.12	0.13	0.09
	(0.02)	(0.05)	(0.05)	(0.05)
Age 65-69	0.10	0.20	0.20	0.15
	(0.04)	(0.07)	(0.07)	(0.06)
Age 70-74	0.09	0.03	0.05	0.07
	(0.02)	(0.06)	(0.06)	(0.06)
Female	0.01	0.17	0.19	0.12
	(0.05)	(0.05)	(0.05)	(0.04)
Female *Age 55-59	0.05	-0.10	-0.12	-0.07
	(0.04)	(0.05)	(0.05)	(0.05)
Female *Age 60-64	0.07	-0.15	-0.17	-0.06
	(0.04)	(0.06)	(0.06)	(0.05)
Female *Age 65-69	0.01	-0.21	-0.21	-0.11
	(0.07)	(0.08)	(0.08)	(0.06)
Female *Age 70-74	-0.02	-0.22	-0.22	-0.16
	(0.06)	(0.06)	(0.07)	(0.06)
Constant	0.75	0.21	0.19	0.17
	(0.01)	(0.04)	(0.04)	(0.05)
Observations	523	523	523	523
R-squared	0.03	0.04	0.05	0.03

Note: The same note applies as Table 2.

Appendix Table 4: Determination of Contact Success and Survey Response when Interviewers do not attend a Training Session
Dependent Variable: Success / Number of Targeted Observations
Unit of Observations: Sampling Geographical Unit * Sex * Age Groups

	(1)	(2)	(3)	(4)
	Contact	Response	Interview 1st half	Interview 2nd half
Adachi	-0.07	-0.11	-0.14	-0.24
	(0.03)	(0.04)	(0.04)	(0.04)
Age 55-59	-0.12	-0.06	-0.05	-0.00
	(0.03)	(0.01)	(0.02)	(0.01)
Age 60-64	-0.07	-0.03	0.06	0.11
	(0.03)	(0.01)	(0.01)	(0.01)
Age 65-69	-0.15	0.16	0.24	0.16
	(0.05)	(0.00)	(0.01)	(0.01)
Age 70-74	0.00	0.08	0.18	0.21
	(0.02)	(0.13)	(0.12)	(0.11)
Female	0.05	0.08	0.14	0.20
	(0.02)	(0.01)	(0.02)	(0.03)
Female *Age 55-59	0.10	0.06	0.04	-0.06
	(0.03)	(0.01)	(0.02)	(0.03)
Female *Age 60-64	-0.01	-0.16	-0.26	-0.39
	(0.04)	(0.03)	(0.02)	(0.02)
Female *Age 65-69	-0.02	-0.19	-0.24	-0.18
	(0.07)	(0.01)	(0.01)	(0.02)
Female *Age 70-74	0.12	0.06	-0.00	-0.18
	(0.04)	(0.10)	(0.09)	(0.09)
Constant	0.87	0.33	0.26	0.25
	(0.03)	(0.03)	(0.04)	(0.04)
Observations	109	109	109	109
R-squared	0.11	0.10	0.15	0.24

Note: The same note applies as Table 2.