RIETI Discussion Paper Series 19-E-091

Preference for Elder Policy: Evidence from a Large-scale Conjoint Survey Experiment

KAWATA, Keisuke
University of Tokyo

YIN, Ting
RIETI

YOSHIDA, Yuichiro
Hiroshima University

RIETI
Research Institute of Economy, Trade & Industry, IAA

The Research Institute of Economy, Trade and Industry
https://www.rieti.go.jp/en/

RIETI Discussion Paper Series 19-E-091

November 2019

Preference for Elder Policy: Evidence from a Large-scale Conjoint Survey Experiment[1]

Keisuke KAWATA (University of Tokyo)
Ting YIN (Research Institute of Economy, Trade and Industry)
Yuichiro YOSHIDA (Hiroshima University)

Abstract

The paper estimates the preference for elder policy by using a large scale conjoint survey experiment. While the conjoint survey design allows us to evaluate multiple policy topics, the main interest is mixed elderly care. Methodologically, the paper proposes a parallel design for additional attributes, which allows us to identify the AMCE, conditional on the respondent's policy concern. Our results consistently show positive support for mixed elderly care.

JEL classification code: C99, D10, J14
Key words: Elderly policy, Policy preference, Conjoint survey experiments

[1]This study is conducted as a part of the Project "Economic Analysis of the Development of the Nursing Care Industry in China and Japan" undertaken at the Research Institute of Economy, Trade and Industry (RIETI). The author is grateful for helpful comments and suggestions from Makoto Yano, Masayuki Morikawa and Discussion Paper seminar participants at RIETI.

1. Introduction

The sustainable provision of elderly services is an urgent matter especially in Japan. Japanese government started the public care insurance from 2000, which covers the various services. While the insurance achieves a certain level of success, it still faces many problems.

Two urgent matters are namely, controlling financial burden and providing more convenient services. To achieve those goals, the combined care service has been attracted by policy makers. The combined service allows household to use not only covered service but also uncovered service with market price.

Even if the combined service is supported by policy makers, mass supports must be also needed. However, there are no studies estimating policy preference on the combined care services.

The present paper firstly estimates people's preference on the combined care service, in addition to other "elderly policy" including public care insurance, medical insurance, and pension. We employ the full-randomized conjoint survey experiment (Hainmueller, Hopkins, & Yamamoto, 2014), which can simply identify the causal effects of each policy on policy supports. While the experiment already applies to estimate preference of various policies (for instance, Bechtel & Scheve 2013 on global climate agreements, Hainmueller, Hangartner, & Yamamoto 2015 on migration policy,

and Horiuchi, Smith, & Yamamoto 2018 on actual manifesto in Japanese election), no papers estimate the preference on the elderly care policy.

Additionally, the heterogeneous policy preference is also discovered by using the machine learning technique. The technique is relevant with our data because the data is large scale (more than 20,000 respondents) and many background characteristics.

We find significant mass support for the combined care supports; the support for manifesto is increased 2% on average. Additionally, significant heterogeneity of policy preference is also discovered.

2. Data

We conduct an online survey "Internet Survey on the Demand for home Nursing Care" for Japanese respondents by the Research Institute of Economy, Trade, and Industry (implemented by the Rakuten insight, Inc.) in October2018. The survey includes 22,000respondents who engage in the conjoint survey experiment. All respondents followed the same procedure; (1) a conjoint experiment for elderly care service, (2) a conjoint experiment for elder policies, and (3) the background survey. Note that the present paper does not use the first experiment result.

In the conjoint survey, respondents are randomly assigned into one of three groups; (1) control group, (2) randomized group, and (3) self-choice group. After the group assignment is done, they are required to complete 10 choice tasks. In each task, two

hypothetical manifesto are presented, and the respondent then asks whether she/he supports each of two hypothetical manifesto.

Each hypothetical manifesto shown to the respondent is consisted of multiple attributes. For respondents in the control group, the manifesto consists of four basic attributes on policy reforms only. They are namely (1) Burden of public care insurance (referred to as **Care insurance (Burden)**), (2) contents of public elderly care insurance (**Care insurance (Service)**), (3) public medical insurance (**Medical insurance**), and (4) **public pension (Pension)**. These attribute takes values as follows;

Basic attributes

- Care insurance(Burden): (1) No reform, (2) Increasing share of self-payment, and (3) Increasing burden of working age.
- Care insurance(Service): (1) No reform, (2) Encouraging combined care, and (3) Expanding service contents.
- Medical insurance: (1) No reform, (2) Increasing burden of all elder persons, and (3) Increasing burden of rich elder persons.
- Pension: (1) No reform, and (2) Raising providing starting age.

Manifesto for the randomized and the self-choice group additionally include one of two augmented attributes (5) education (referred as **Education**) and (6) value-added tax (**VAT**). Values of these attributes are;

- Education: (1) No reform, (2) Free kindergarten, (3) Free high school, and (4) Scholarship for undergraduates.
- VAT: (1) No reform, (2) Remaining 8%, and (3) Delaying 10%.

The key difference between the random and choice groups is that the augmented attribute is randomly selected between Education and VAT for those respondents in the random group, while for those in the choice group, respondents make their choice between the two. Consequently, respondents are classified into the following two groups; (1) Consistent group who can observe their concerned policy attributes and (2) Inconsistent group who cannot observe their concerned attributes.

The background survey collects rich information of basic characteristics, for instance, gender, age, education level, living location, and family structure of respondents. Because all values of attributes are randomized, the identification of causal effects do not require those characteristics. However, as discussed in the next section, those characteristics allows us to preciously predict the individual causal effects.

3. Framework

The main purpose is identification and characterization of the conditional average policy support by concerned policy topics. As shown latter, the survey result in the randomized and self-choice groups is allows us the identifications.

3.1. Notation

Main research interest here is to identify the heterogeneity in policy preference among respondents with different policy concerns. Our survey design allows us to identify in particular the heterogeneity between respondents concerning VAT and education policy. Let $W_i = V, E$ indicate respondent i's policy concern, where $W_i = V$ and $W_i = E$ if his/her policy concern is the VAT and the education policy respectively.

Let A_i be a vector of observable policy attributes for respondent i. $Y_i\ (A_i)$ is a potential outcome; $= 1$ if a policy A_i is supported by the respondent, and $= 0$ if the policy is not supported. A subscript i in A_i is suppressed for notation simplicity hereon, unless it is necessary.

The observable policy attribute vector A potentially consists from three types of attributes, a basic attribute vector A_B, VAT attribute A_V, and education attribute A_E. The observable attributes are then as follows;

- Control group: $A = \{A_B\}$,
- VAT observers in the randomized and choice groups: $A = \{A_B, A_V\}$,

- Education observers in the randomized and choice groups: $A = \{A_B, A_V\}$.

3.2. Estimand

The paper focuses on the average policy support conditional on respondent's policy concern $E[Y_i(A)|W_i = I]$. There are two estimands. First estimand is the average marginal component effect, AMCE introduced by Hainueller, Hopkins, and Yamamoto (2014). AMCE of improving an attribute say A_l from its baseline level a_0 to another level a_1 is defined as

$$\pi_l(a_1, a_0|W_i = I) = \sum_{A_{-l}} E\left[Y_i(a_1, A_{-l}) - Y_i(a_0, A_{-l})|W_i = I\right] \times f(A_{-l}).$$

where $A_(- l)$ is a vector of attributes excluding attribute l, and $f(A_(- l))$ is their joint probability distribution. In our survey, $f(A_(- l))$ is by construction a joint uniform distribution.

The second estimand, $\tau(A)$, is the difference in the policy support between education-concerned and VAT-concerned respondents, defined as

$$\tau(A) = E[Y_i(A)|W_i = E] - E[Y_i(A)|W_i = V],$$

A difficulty to identify $\tau(A)$ here is that W_i is not directly observed from data. The next section shows that this estimand is identifiable through comparing the randomized and choice group.

3.3. Identificatoin

Conditional averate policy support

Identification of the conditional average policy support, $E[Y_i(A)|W_i = I]$, requires the following assumptions.

Exogeneity *No confounders exist between the group-assignment and potential outcome in addition to the concerned policy attributes.*

Exogeneity implies that between random and choice groups, the proportion of those respondents who are concerned with any augmented attribute are equal. That is, for any $I \in \{E, V\}$,

$$Pr[W_i = I \,|\, G_i = C] = Pr[W_i = I \,|\, G_i = R].$$

This assumption is justified from the fact that the respondents are randomly assigned to the random and choice groups. This further implies that, the potential outcome of type-I respondents (i.e., those who are concerned with policy attribute I) are the same regardless of the group that they are assigned into:

$$E[Y_i(A)|W_i = I, G_i = R] = E[Y_i(A)|W_i = I, G_i = C].$$

Relevance *Observed outcome of respondents who are assigned to the choice group and observed an augmented attribute A_I is equal to the potential outcome of the type-I respondents, i.e.,*

$$E[Y_i(A)|G_i = C] = E[Y_i(A)|W_i = I]$$

where $A = (A_B, A_I)$ for any $I \in \{E, V\}$.

Relevance connects the observable outcome and the potential outcome by assuming that the choices made by respondents in the choice group is consistent with their policy concern.

Exclusive restriction *The group assignment has no direct effect on the potential outcome, or equivalently*

$$E[Y_i(A)|G_i = C] = E[Y_i(A)|G_i = R]$$

for any $I \in \{V, E\}$.

Exclusion restriction tells that the potential outcome does not depend on the group-assignment.

Next, we identify the expected potential outcomes for those in Consistent group who can observe their concerned policy attributes, $E[Y_i(A_B, A_I)|W_i = I]$, and for those in the Inconsistent group who cannot observe their concerned attributes namely, $E[Y_i(A_B, A_I)|W_i \neq I]$. These are interpreted as the average policy support.

First, the relevance condition directly identifies the average policy support in the consistent group as

$$E[Y_i(A_B, A_I)|W_i = I] = E[Y_i^{obs}|A_i^{obs} = \{A_B, A_I\}, G_i = C] \quad (1)$$

for each $I \in \{V, E\}$, where the superscript obs indicates the observed variables. The equation says that the observed outcomes in the choice group allows us to identify an average support of each type of respondents.

Second is to identify the average support in the inconsistent group. The Exogeneity and Exclusion restriction allows us to interpret the average choice support in the randomized group as the weighted average of policy support in the consistent and inconsistent groups;

$$E[Y_i^{obs}|A_i^{obs} = \{A_B, A_I\}, G_i = R] = E[Y_i(A_B, A_I)] \equiv \Pr[W_i = I] \times E[Y_i(A_B, A_I)|W_i = I]$$

$$+\Pr[W_i \neq I] \times E[Y_i(A_B, A_I)|W_i \neq I] \quad (2).$$

for any $I \in \{V, E\}$. Here, the second equality yields that

$$E[Y_i(A_B, A_I)|W_i \neq I] = \frac{1}{\Pr[W_i \neq I]} E[Y_i(A_B, A_I)]$$

$$-\frac{\Pr[W_i = I]}{\Pr[W_i \neq I]} E[Y_i(A_B, A_I)|W_i = I] \quad (3)$$

for any $I \in \{V, E\}$. The average policy support in the inconsistent group can be then rewritten by the average policy support in the randomized and the consistent group.

Finally, combining equations (1) to (3) yields the identified average support in the inconsistent group as

$$E[Y_i(A_B, A_I)|W_i \neq I] = \frac{1}{\Pr[W_i \neq I]} E[Y_i^{obs}|A_i^{obs} = \{A_B, A_I\}, G_i = R]$$

$$-\frac{\Pr[W_i = I]}{\Pr[W_i \neq I]} E[Y_i^{obs} | A_i^{obs} = \{A_B, A_I\}, G_i = C]. \quad (4)$$

AMCE

The average marginal component effect, AMCE (Hainmueller, Hopkins, & Yamamoto, 2014) is useful to understand the structure of the average policy support. Because attribute levels are randomized, AMCEs are also simply identified.

Without loss of generality, let us suppose $A = \{A_B, A_I\}$. First, equations (1) and (2) yield that the AMCE of attribute l for consistent group is that

$$\pi_l(a_1, a_0 | W_i = I) \equiv E[Y_i(a_1, A_{-l}) - Y_i(a_0, A_{-l}) | W_i = I]$$

$$= E[Y_i^{obs} | A_i^{obs} = \{a_1, A_{-l}\}, G_i = C] - E[Y_i^{obs} | A_i^{obs} = \{a_0, A_{-l}\}, G_i = C],$$

where a_i for $i \in \{0,1\}$ is the level of the lth attribute, A_l. AMCE of changing attribute l's level from a0 to a1 for for both groups in general is

$$\pi_l(a_1, a_0) \equiv E[Y_i(a_1, A_{-l}) - Y_i(a_0, A_{-l})]$$

$$= E[Y_i^{obs} | A_i^{obs} = \{a_1, A_{-l}\}, G_i = R] - E[Y_i^{obs} | A_i^{obs} = \{a_0, A_{-l}\}, G_i = R].$$

These together with equation (3), finally give the AMCE in the inconsistent group as

$$\pi_l(a_1, a_0 | W_i \neq I) \equiv E[Y_i(a_1, A_{-l}) | W_i \neq I] - E[Y_i(a_0, A_{-l}) | W_i \neq I]$$

$$= \frac{1}{\Pr[W_i \neq I]} \pi_l(a_1, a_0) - \frac{\Pr[W_i = I]}{\Pr[W_i \neq I]} \pi_l(a_1, a_0 | W_i = I).$$

Difference-in-means

The difference of policy supports between consistent and inconsistent groups is defined as

$$E[Y_i(A_B, A_I)|W_i = I] - E[Y_i(A_B, A_I)|W_i \neq I],$$

which can be identified by combining equations (1) and (4) as

$$E[Y_i(A_B, A_I)|W_i = I] - E[Y_i(A_B, A_I)|W_i \neq I] = E[Y_i^{obs}|A_i^{obs} = A_B, A_I, G_i = C]$$

$$-\frac{1}{Pr[W_i \neq I]} E[Y_i^{obs}|A_i^{obs} = A_B, A_I, G_i = R]$$

$$+\frac{Pr[W_i = I]}{Pr[W_i \neq I]} E[Y_i^{obs}|A_i^{obs} = A_B, A_I, G_i = C]$$

$$= \frac{(E[Y_i^{obs}|A_i^{obs} = \{A_B, A_I\}, G_i = C] - E[Y_i^{obs}|A_i^{obs} = \{A_B, A_I\}, G_i = R])}{(Pr[W_i \neq I])}.$$

Note that this expression allows us to apply the machine learning technique to detect any relevant heterogeneity in causal effects between consistent and inconsistent group with respect to the set of attributes to be observed. Specifically, the causal forest is applied to estimate the numerator, i.e., $E[Y_i^{obs}|A_i^{obs} = \{A_B, A_I\}, G_i = C] - E[Y_i^{obs}|A_i^{obs} = \{A_B, A_I\}, G_i = R]$.

4. Estimation.

This section reports the estimation results especially the AMCE.

4.1. AMCE.

The AMCE in the controlled group are firstly shown. The results capture the policy preference without additional treatment.

Fig 1. Baseline AMCEs.

The figure shows that respondents tend to prefer reforms (1) more burden for the rich elders, (2) allowing mixed elderly care, (3) expanding the contents of care service, while do not prefer (1) increasing payment age of public pension, (2) more burden for the working age, and (3) increasing self-payment.

The next figure reports the AMCEs of respondents observing the education topic.

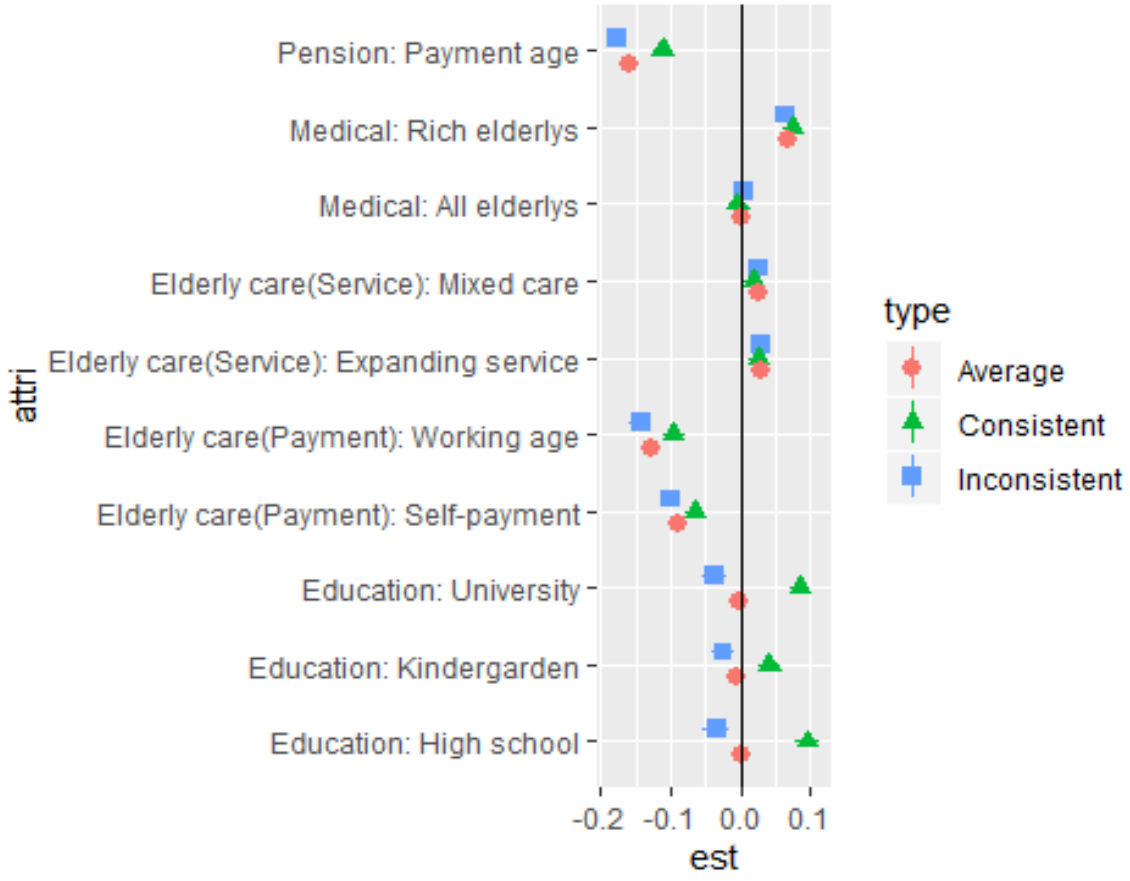

Fig 2. AMCE of respondents the education observers.

An interesting findings is that the reform of education policy is preferred by only the education concerned group. The point estimator of AMCE are positive in the consist

group while negative in the inconsistent group, which implies that the AMCE of those reform is quit small and statistically insignificant, and the inconsistent group do not then prefer.

Among the education reform, the scholarship for undergraduates and high school is more preferred than the kindergarten.

The preference for basic attributes are qualitatively same with the baseline results, but some quantitative heterogeneous is found. The negative impacts of pension and elderly care reform are weaker in the consistent group than education concerned groups in the inconsistent group.

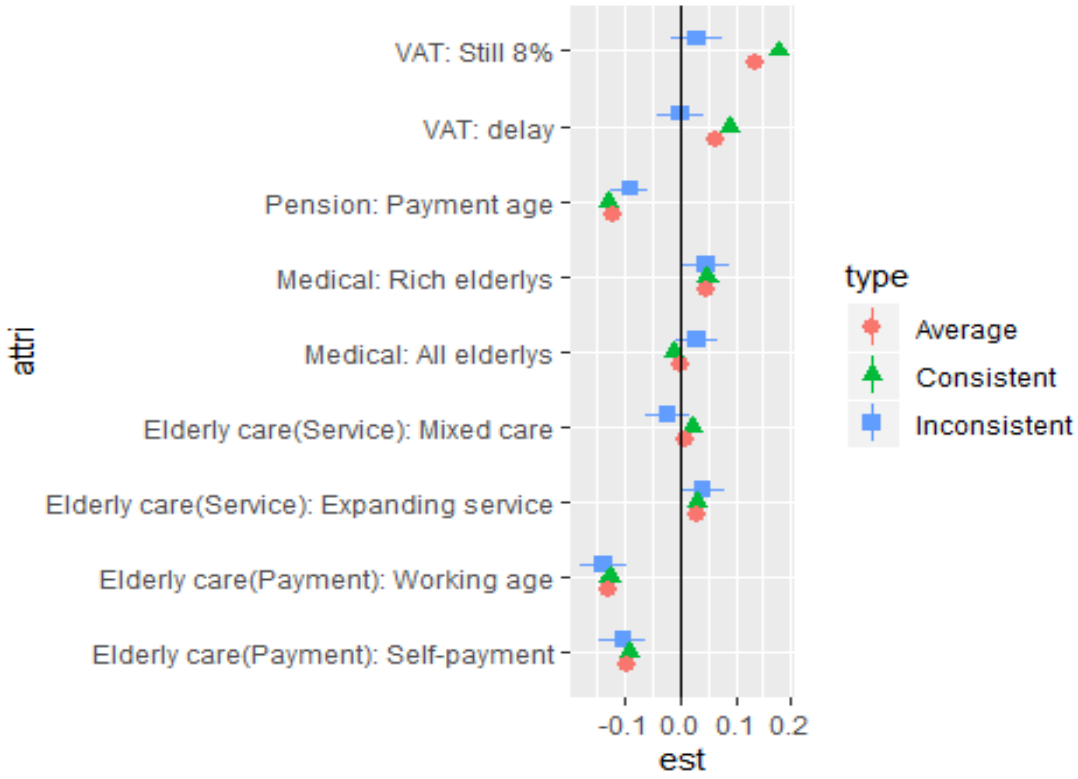

Fig 3. AMCE of the VAT observers.

The result for the VAT reform shows that the VAT concerned group prefer the VAT reform (stop the VAT increase) than the education concerned group.

AMCE of basic attributes are also different between consist and inconsistent groups. However, the clear conclusion is hard to obtain because the confidence interval in the inconsistent group is bigger.

5. Conclution.

The paper estimates the preference for elder policy by using a large scale online survey. The survey consistently shows the positive support for the mixed elderly care. The support for the mixed care have almost similar size as the support for the expanding service covered by the public subsidies.

Those findings imply the strong demand for the expanding service contents even without pubic subsidies.

Methodologically, the paper extends the full-randomized conjoint design into the information treatment and the parallel design. The new design allows us to identify the AMCE conditional on the respondent's policy concern.

Our application finds the heterogeneous preference for some policies. Most clear difference is for the policy for expanding education subsidies. The policy tend to be

supported by respondents concerning the education policy, while not supported by the VAT concerned respondents. Meanwhile, the support for the mixed care is not significantly different.

Reference

- Athey, S., & Wager, S. (2019). Estimating Treatment Effects with Causal Forests: An Application. arXiv preprint arXiv:1902.07409.
- Athey, S., Tibshirani, J., & Wager, S. (2019). Generalized random forests. The Annals of Statistics, 47(2), 1148-1178.
- Bansak, K., Hainmueller, J., Hopkins, D. J., & Yamamoto, T. (2017). Beyond the breaking point? Survey satisficing in conjoint experiments. Political Science Research and Methods, 1-19.
- Bansak, K., Hainmueller, J., Hopkins, D. J., & Yamamoto, T. (2018). The number of choice tasks and survey satisficing in conjoint experiments. Political Analysis, 26(1), 112-119.
- Bechtel, M. M., & Scheve, K. F. (2013). Mass support for global climate agreements depends on institutional design. Proceedings of the National Academy of Sciences, 110(34), 13763-13768.
- Chernozhukov, V., Demirer, M., Duflo, E., & Fernandez-Val, I. (2018). Generic machine learning inference on heterogenous treatment effects in randomized experiments (No. w24678). National Bureau of Economic Research.

- Hainmueller, J., Hopkins, D. J., & Yamamoto, T. (2014). Causal inference in conjoint analysis: Understanding multidimensional choices via stated preference experiments. Political Analysis, 22(1), 1-30.
- Hainmueller, J., Hangartner, D., & Yamamoto, T. (2015). Validating vignette and conjoint survey experiments against real-world behavior. Proceedings of the National Academy of Sciences, 112(8), 2395-2400.
- Horiuchi, Y., Smith, D. M., & Yamamoto, T. (2018). Measuring voters' multidimensional policy preferences with conjoint analysis: Application to Japan's 2014 election. Political Analysis, 26(2), 190-209.
- Wager, S., & Athey, S. (2018). Estimation and inference of heterogeneous treatment effects using random forests. Journal of the American Statistical Association, 113(523), 1228-1242.

Appendix.

Attributes	estimate	conf.low	conf.high
Constant	0.610	0.604	0.616
Elderly care(Payment): Self-payment	-0.095	-0.100	-0.090
Elderly care(Payment): Working age	-0.137	-0.142	-0.132
Elderly care(Service): Mixed care	0.028	0.023	0.033
Elderly care(Service): Expanding service	0.035	0.030	0.040
Medical: All elderlys	-0.002	-0.007	0.004
Medical: Rich elderlys	0.066	0.061	0.071
Pension: Payment age	-0.149	-0.154	-0.144

Table A-1. AMCE wihtout additional attributes.

Type	Attribute	estimate	conf.low	conf.high
Average	Elderly care(Payment): Self-payment	-0.095	-0.105	-0.085
Average	Elderly care(Payment): Working age	-0.131	-0.141	-0.121
Average	Elderly care(Service): Mixed care	0.009	0.000	0.019
Average	Elderly care(Service): Expanding service	0.032	0.022	0.042
Average	Medical: All elderlys	-0.001	-0.010	0.008
Average	Medical: Rich elderlys	0.048	0.038	0.058
Average	Pension: Payment age	-0.121	-0.129	-0.112
Average	VAT: Still 8%	0.137	0.126	0.148
Average	VAT: delay	0.064	0.053	0.074
Type	Attribute	estimate	conf.low	conf.high
Consistent	Elderly care(Payment): Self-payment	-0.092	-0.100	-0.083
Consistent	Elderly care(Payment): Working age	-0.128	-0.137	-0.120
Consistent	Elderly care(Service): Mixed care	0.022	0.014	0.030
Consistent	Elderly care(Service): Expanding service	0.029	0.021	0.037
Consistent	Medical: All elderlys	-0.013	-0.021	-0.005
Consistent	Medical: Rich elderlys	0.049	0.040	0.057

Consistent	Pension: Payment age	-0.132	-0.139	-0.125
Consistent	VAT: Still 8%	0.178	0.168	0.188
Consistent	VAT: delay	0.089	0.081	0.097
Type	Attribute	estimate	conf.low	conf.high
Inconsistent	Elderly care(Payment): Self-payment	-0.104	-0.147	-0.061
Inconsistent	Elderly care(Payment): Working age	-0.138	-0.180	-0.096
Inconsistent	Elderly care(Service): Mixed care	-0.024	-0.063	0.016
Inconsistent	Elderly care(Service): Expanding service	0.040	-0.001	0.081
Inconsistent	Medical: All elderlys	0.031	-0.008	0.070
Inconsistent	Medical: Rich elderlys	0.048	0.005	0.090
Inconsistent	Pension: Payment age	-0.091	-0.124	-0.058
Inconsistent	VAT: Still 8%	0.031	-0.016	0.077
Inconsistent	VAT: delay	0.000	-0.043	0.042

Table A-2. AMCE of education observars.

Type	Attribute	estimate	conf.low	conf.high
Average	Elderly care(Payment): Self-payment	-0.095	-0.105	-0.085
Average	Elderly care(Payment): Working age	-0.131	-0.141	-0.121
Average	Elderly care(Service): Mixed care	0.009	0.000	0.019
Average	Elderly care(Service): Expanding service	0.032	0.022	0.042
Average	Medical: All elderlys	-0.001	-0.010	0.008
Average	Medical: Rich elderlys	0.048	0.038	0.058
Average	Pension: Payment age	-0.121	-0.129	-0.112
Average	VAT: Still 8%	0.137	0.126	0.148
Average	VAT: delay	0.064	0.053	0.074
Type	Attribute	estimate	conf.low	conf.high
Consistent	Elderly care(Payment): Self-payment	-0.092	-0.100	-0.083
Consistent	Elderly care(Payment): Working age	-0.128	-0.137	-0.120
Consistent	Elderly care(Service): Mixed care	0.022	0.014	0.030
Consistent	Elderly care(Service): Expanding service	0.029	0.021	0.037
Consistent	Medical: All elderlys	-0.013	-0.021	-0.005
Consistent	Medical: Rich elderlys	0.049	0.040	0.057

Consistent	Pension: Payment age	-0.132	-0.139	-0.125
Consistent	VAT: Still 8%	0.178	0.168	0.188
Consistent	VAT: delay	0.089	0.081	0.097
Type	Attribute	estimate	conf.low	conf.high
Inconsistent	Elderly care(Payment): Self-payment	-0.104	-0.147	-0.061
Inconsistent	Elderly care(Payment): Working age	-0.138	-0.180	-0.096
Inconsistent	Elderly care(Service): Mixed care	-0.024	-0.063	0.016
Inconsistent	Elderly care(Service): Expanding service	0.040	-0.001	0.081
Inconsistent	Medical: All elderlys	0.031	-0.008	0.070
Inconsistent	Medical: Rich elderlys	0.048	0.005	0.090
Inconsistent	Pension: Payment age	-0.091	-0.124	-0.058
Inconsistent	VAT: Still 8%	0.031	-0.016	0.077
Inconsistent	VAT: delay	0.000	-0.043	0.042

Table A-3. AMCE of VAT observars.