

A Conjoint Analysis of Japanese Voters' Policy Option Preferences

—A Case Study of the October 2021 General Election

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1. Introduction

This study explores voters' preferences for policy options using conjoint analysis, a technique widely used in the field of marketing (Rao, 2014). In marketing, when exploring the needs of products with special characteristics, especially in new product development, a product is regarded as a “bundle” of various attributes (color, shape, size, function, etc.). A consumer compares products A and B with different bundles of attributes, and selects one of them. This marketing method is applicable to voting behavior if “consumer” is replaced with “voter,” “attribute” with “policy categories and options therein,” and “product” with “manifest or policy alternative.”

We conducted a questionnaire survey on policy alternatives via the Internet during the campaign period of the House of Representatives general election held in Japan in October 2021. The results are analyzed to examine voters' preferences for the policy options. This study is characterized by the timing of its survey. This was inspired by Horiuchi, Smith, and Yamamoto (2018), HSY hereafter, who conducted a survey during the campaign period of the 2014 House of Representatives election. The second feature of our study is that the preference for policy options is evaluated as the willingness-to-pay (WTP), differentiating us from HSY. As a political science study, HSY were interested in a desirable combination of policy options to increase the possibility of winning the election. A focus on WTP, together with different financing methods to implement policies, provides new evidence on fiscal illusion that voters pay insufficient attention to the intertemporal budget constraint the government faces (Buchanan and Wagner, 1977, Ch.9)²⁾.

The rest of this paper is structured as follows. In Section 2, the model is outlined, whereas the survey design is explained in Section 3. The survey results are examined in Section 4, and concluding remarks are presented in Section 5.

2. Model

We use a standard model in the discrete choice experiment literature³⁾. Random utility theory allows us to decompose utility gained from commodity i into a deterministic part, V_{in} , and a stochastic one, ε_{in} :

$$U_{in} = V_{in} + \varepsilon_{in}. \quad (1)$$

The fact that individual n selects commodity i rather than commodity j means:

$$\begin{aligned} U_{in} - U_{jn} &= V_{in} - V_{jn} + \varepsilon_{in} - \varepsilon_{jn} > 0, \\ V_{in} - V_{jn} &> \varepsilon_{jn} - \varepsilon_{in}. \end{aligned} \quad (2)$$

further, suppose there are k determinants of the deterministic part, V_{in} , which is modeled as below, assumes their linear combination. Here, β_{kn} is the weight an individual n gives an attribute k , or the partial utility they gain from the attribute.

$$V_{in} = \sum_{k=1}^K \beta_{kn} x_{ik} = \mathbf{X}_i \boldsymbol{\beta}_n \quad (3)$$

The above leads to the following expression of the probability of individual i 's choice:

$$\begin{aligned} \Pr(U_{in} > U_{jn}) &= \Pr(V_{in} - V_{jn} > \varepsilon_{jn} - \varepsilon_{in}) = \Pr((\mathbf{X}_i - \mathbf{X}_j) \boldsymbol{\beta}_n > \varepsilon_{jn} - \varepsilon_{in}) \\ &= \Pr(\mathbf{X}_{ij} \boldsymbol{\beta}_n > -\varepsilon_n) = \Pr(\varepsilon_n < \mathbf{X}_{ij} \boldsymbol{\beta}_n) \\ &= F(\mathbf{X}_{ij} \boldsymbol{\beta}_n), \end{aligned} \quad (4)$$

where symmetry of probability distribution function is assumed, and F is a cumulative distribution function.

Furthermore, assume that the stochastic part, ε_{in} , independently and identically follows a Gumbel distribution, and that utility from commodity i is the largest among more than three commodities belonging to the commodity set, $S = \{1, 2, \dots, I\}$. The probability that commodity i is selected is modeled by a conditional logit model as follows:

$$P_n(i) = \frac{\exp(\mathbf{X}_i \boldsymbol{\beta}_n)}{\sum_{i=1}^I \exp(\mathbf{X}_i \boldsymbol{\beta}_n)}. \quad (5)$$

For example, let $K-1$ variables be dummies with values of unity for excellent quality and null for normal quality. The last K -th, x_{iK} , stands for a continuum variable representing price. This set-up enables us to estimate how much one will pay for the characteristics the k -th dummy stands for with its unity value, that is, WTP, by the following formula:

$$WTP_n = -\frac{\beta_{kn}}{\beta_{Kn}}, \quad k=1, \dots, K-1. \quad (6)$$

Although WTP could be individually different, a unique value for all the participants is gained if the commonality assumption is adopted. A less stringent case is that the commonality assumption is limited to a group classified by personal characteristics. It would do to include in Eq. (3) the interaction terms $\mathbf{D}_g \cdot \mathbf{X}_i$, where \mathbf{D}_g ($g=1, \dots, G$) show whether respondents belong to specific groups. These modifications could produce a group specific WTP, WTP_g .

3. Outline of the Survey

Our survey is outlined in this section.

(1) Survey period

The survey was conducted during the campaign period of the House of Representatives election last year because

we were interested in how voters evaluated policy options when each party made a pledge and competed for policy alternatives in the election. Specifically, the 49th House of Representatives election was announced on Tuesday, October 19, and the voting and ballot counting was scheduled on Sunday, October 31. The questionnaire was delivered to the monitors on the Friday evening, October 22, and the collection was completed on Monday, October 25. In other words, the respondents answered the questionnaire over the first weekend in the middle of the campaign period. This was likely when they gained much information, judging from media coverage of the election; five major newspapers posted their own comparison tables of campaign promises announced by major parties in their morning editions on Saturday, October 23.

(2) Survey participants

Implementation of the survey was entrusted to a research company. Individuals registered as monitors with the research company participated if they were interested in the questionnaire contained in the questionnaire package. The total number of respondents was set to 1000 each for men and women. The age group compositions of each sex were adjusted to be equal to their census counterpart. After answering the policy option questions, the participants were requested information about their personal attributes. An overview of participants' personal characteristics is presented in Table 1.

Interestingly, in response to the question asking whether to vote in the coming election, about 70% of the respondents answered that they “will or have done,” that is, have cast an early vote. Notably, this is considerably higher than the turnout of 55.93% announced by the Ministry of Internal Affairs and Communications⁴⁾.

(3) Survey items

Regarding the questions in the survey⁵⁾, as presented in Table 2, two or three options (or “levels” according to conjoint analysis terminology) are provided for each of the seven policy areas (or “attributes”). Six of the seven attributes concern campaign promises announced by political parties. We focus on those that may divide opinions and are likely to attract much attention in the election. For each attribute, we set up different levels of whether to continue a conventional policy or to strengthen it in a specified direction.

Participants were asked to answer five questions by choosing one of the three alternatives (Table 3). Two of the three are campaign promises of candidate A and B, and are created by randomly combining the levels of the seven attributes of Table 2, whereas the last one is for those who will not choose either.

To obtain WTP, it is necessary to set a variable representing “price” in the case of marketing, or x_{iK} in the previous section, that is, the seventh attribute in our analysis. However, the appropriateness of the variable is not obvious because it is not always clear at the time of policy selection how the costs of implementing a particular policy are expected to be financed. Therefore, we set two types for the seventh attribute: “an increase in tax burden” and “an increase in budget deficit,” as shown in the last two rows of Table 2. One of them was randomly included in the questions posed to our 2000 participants.

Table 1 Overview of Participants' Personal Characteristics

Personal characteristics, N = 2,000								
Sex		male	female					
	number	1000	1000					
	share	50.0%	50.0%					
Age		18 to 30	31 to 60	61 and above				
	number	300	938	762				
	share	15.0%	46.9%	38.1%				
Job		self-employed	regular worker	non-regular	housework	student	not working	
	number	146	640	272	412	75	455	
	share	7.3%	32.0%	13.6%	20.6%	3.8%	22.8%	
Marriage		married	not married	widowed or divorced				
	number	650	1126	224				
	share	32.5%	56.3%	11.2%				
Children		no	yes					
	number	880	1120					
	share	44.0%	56.0%					
individual annual revenue		up to ¥3 mil.	¥3 to 6 mil.	¥6 mil. or more	no answer			
	number	1013	473	251	263			
	share	50.7%	23.7%	12.6%	13.2%			
Kishida Administration		support	not support					
	number	887	1113					
	share	44.4%	55.7%					
Supporting Political Party		LDP	Komei	CDP (1)	Communist Party	JIP (2)	others	No party
	number	506	46	165	56	149	91	987
	share	25.3%	2.3%	8.3%	2.8%	7.5%	4.6%	49.4%
Voting		will go or have done	will not go	have not decided				
	number	1413	199	388				
	share	70.7%	10.0%	19.4%				
A priority in voting		policies	characters	party	others			
	number	765	396	453	187			
	share	42.5%	22.0%	25.2%	10.4%			
volunteer in a year		yes	no					
	number	1747	253					
	share	87.4%	12.7%					

Note 1: CDP = Constitutional Party in Japan

2: JIP = Japan Innovation Party

Table 2 Outline of the Questionnaire: Attributes and Level

Policy category (attribute)	Option (level)		
1) Counter-COVID-19 measures (to reduce human contacts and reinforce medical care supply systems)	a. grant the central government stronger authority	b. remain unchanged	
2) Measures aiming at a higher economic growth rate	a. encourage economic growth	b. remain unchanged	
3) Measures aiming at more equitable income distribution (by reducing poverty and income disparities)	a. reduce poverty and income disparities, thereby increasing the number of middle-income people	b. remain unchanged	
4) Measures for next generations (such as support for pregnancy, childbirth, infant care, and education)	a. stronger support for pregnancy, childbirth, infant care, and education	b. remain unchanged	
5) Measures for secure elderly lives (with pension, medical, and nursing care)	a. secure pension systems	b. secure medical and nursing care	c. remain unchanged
6) Measures for energy transition (by reducing dependency on nuclear power plants)	a. aim at zero dependency in the future	b. remain unchanged (restarting to use safe nuclear power plants)	
7-1) Increase in tax burden (measured by tax burden in total)	a. remain unchanged	b. 5 percent increase	c. 10 percent increase
7-2) Increase in fiscal deficits (an increase in new debt)	a. remain unchanged	b. an increase in deficits (equal to 5 percent of tax burden)	c. further increase in deficits (equal to 10 percent of tax burden)

Table 3 Example of Questions Posed to the Participants

Attribute	1)	2)	3)	4)	5)	6)	7-1) or 7-2)
Candidate A	a.	a.	a.	b.	a.	b.	a.
Candidate B	a.	b.	b.	a.	c.	a.	b.
Vote for neither							

4. Results

(1) Overview

First, we estimate Eq.(6) assuming homogeneous preference among the participants. Applying the conditional logit model of Eq.(5) to the survey answers revealed the results shown on the left side of the Reference Table in

Appendix⁶⁾. The resulting WTP estimates on the right side of the table are also shown in Fig. 1 (1), together with their 95% confidence intervals.

According to Figure 1 (1), WTP estimates are significantly positive in all but one attribute, or policy category. However, they vary significantly, depending on the policy categories and their financing methods. In general, the policies are more highly evaluated if they are financed by budget deficit or bond issuance rather than by tax increase. This evaluation difference is a new piece of evidence on fiscal illusion⁷⁾.

Figure 1 (2) lines up policies along X-axis in descending order of the tax-financed WTP estimates. This arrangement clarifies different policy priorities owing to different financing methods. In particular, tax financing places the highest priority on policies for next generations, or evaluates it at least as highly as those for older people, such as pension, medical and nursing care, and for more equitable income distribution. However, the bond issuance financing method more than double the WTP estimates of the latter groups of policies, dwarfing the former.

(2) Differences owing to personal characteristics

Here, we focus on a personal characteristic, voting behavior. Figure 2 shows clearly different evaluations among the three categories: those who “will go or have done,” “will not go,” and “not decided.” The WTP estimates of the second category are (insignificantly) negative for almost all policy categories. This may be partly because the results reflect their indifference to policy issues.

Those with an indeterminate attitude show their preferences in a few attributes: they prioritize the policies for the next generation, those aiming at strengthening pensions as well as improving distributions but only with budget deficits. Thus, a rise in turnout may lead to reinforcing spending pressure on these policies especially through budget deficit financing.

5. Conclusion

This study examines voters’ preferences for policy options using conjoint analysis. Specifically, an online survey was conducted during the campaign period of the 49th House of Representatives election held in Japan in October 2021. Based on the results, we estimated discrete choice models and obtained WTP estimates for policy options.

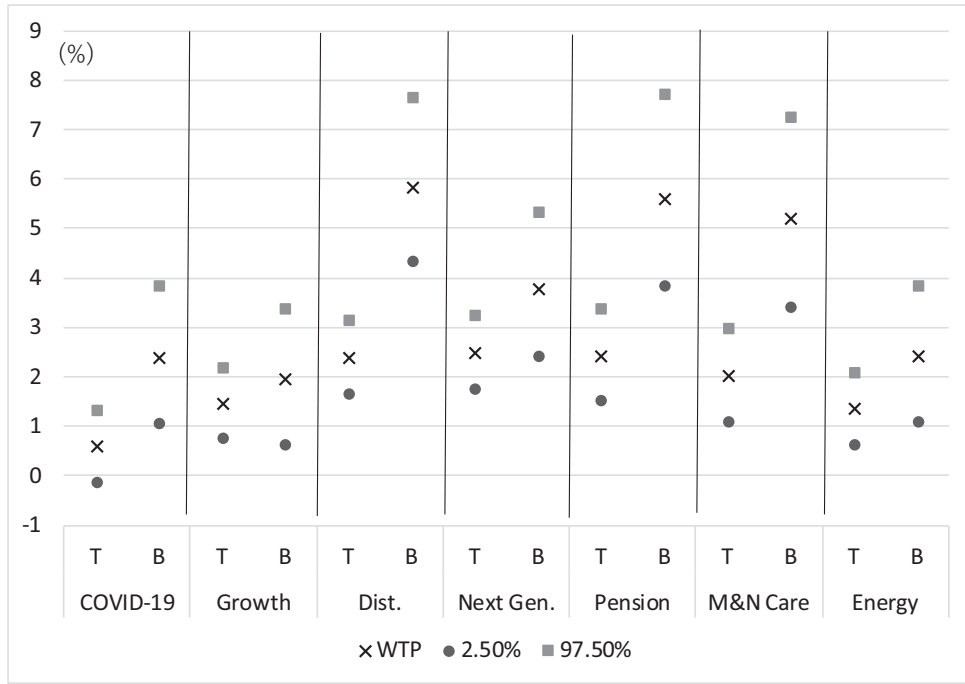
The contributions of this study are summarized in the following three points. First, based on the survey results, voters’ preferences for policy options are exemplified as their WTP. The use of monetary values expressed as WTP enables us to compare preferences of policy options across participants and policy categories, thereby clarifying voters’ priorities.

Second, voters’ evaluations differ significantly depending on whether the policies are to be financed by tax increase or fiscal deficit, that is, future tax increase. This is a new direct indication of fiscal illusion. Third, their WTPs are heavily dependent on personal characteristics, such as voting behavior. This evaluation heterogeneity may imply possible difficulties to build consensus in the policy-making process.

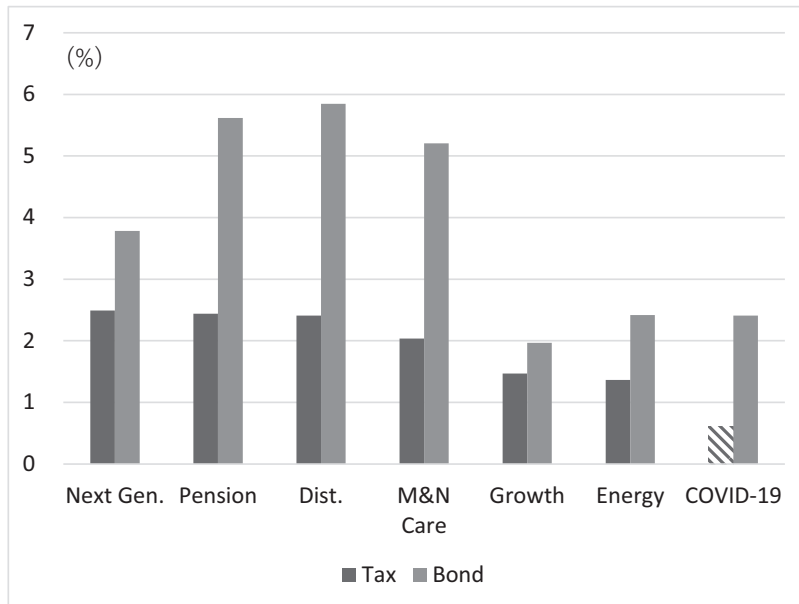
This study is a first step to understand voters’ preference and to formulate desirable policies. Our next task is to dig into heterogeneous WTP estimates at hand, depending on various personal characteristics. This may also shed a new light on fiscal illusion.

Figure 1 WTP estimates

(1) Overview



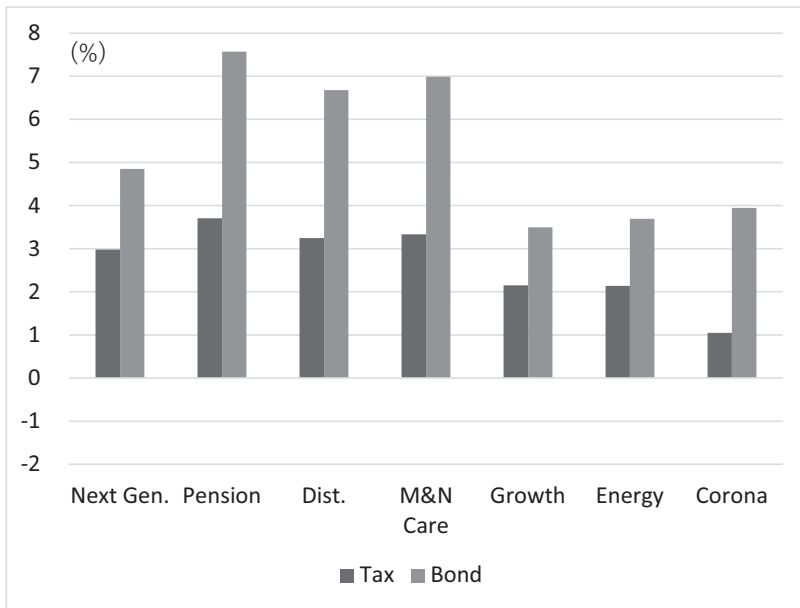
(2) Different Priorities



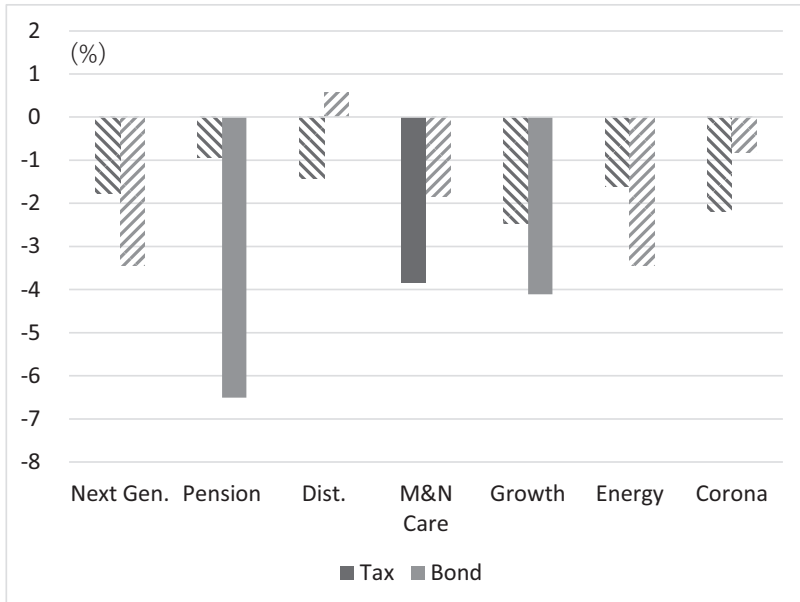
Notes X = point estimates, and the intervals between ● and ■ represent the 95% confidence intervals. Bars are filled if the estimates are significant at 5%, but not otherwise.

Figure 2 WTP estimates by voting behaviors

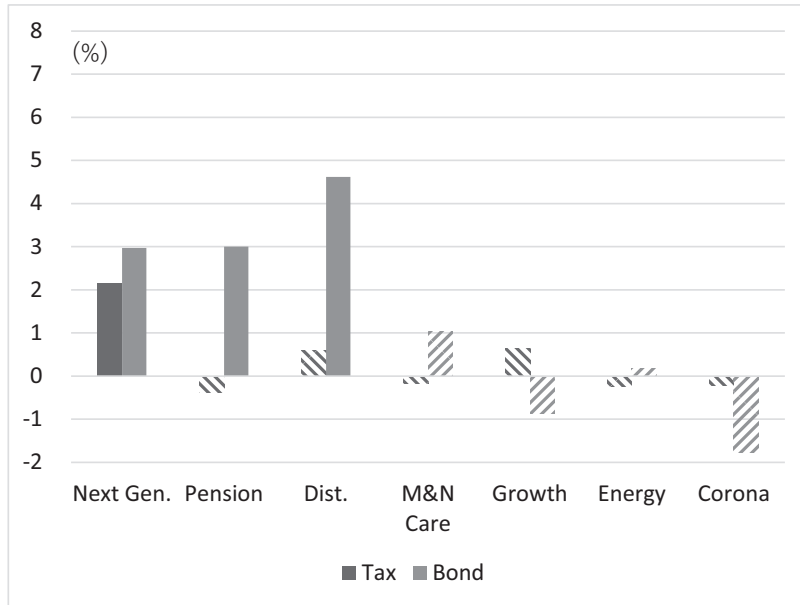
(1) “Will go to vote or have done”



(2) “Will not go”



(3) "Have not decided"



Note: Bars are filled if the estimates are significant at 5%, but not otherwise.

Notes

- 1) Nihon University College of Economics. I would like to appreciate the Institute of Economic Sciences, Nihon University College of Economics for funding the questionnaire survey on which this study is based.
- 2) See also Buchanan (1967, Ch.10) and Wagner (1976).
- 3) This section is based on Greene (2003) and Aizaki et al. (2015).
- 4) In general, the percentage of respondents who say they will "vote" in the preliminary polls conducted by the media exceeds the turnout. For example, according to surveys conducted by NHK two weeks before the polling date for the five 21st to 25th House of Councilors elections from 2007 to 2019 (Masaki and Aramaki, 2019), the average of the answer of "definitely go to vote (plus cast an early vote)" stands at 63%, about 8.5 percentage points higher than the average official outcomes, 54.53%.
- 5) See Kawagoe (2021, 2022) for a similar, but simpler questionnaire survey conducted at a research institute, the Institute of Economic and Social Systems (IESS), in July 2021. My experience at the IEISS benefited this study.
- 6) We used R programs based on Aizaki et al. (2015), among others.
- 7) Dollery and Worthington (1996) provides with a survey of empirical evidence of fiscal illusion.

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Appendix. Estimation Results

Here we will provide estimation results of Eq. (4) using conditional logit models, and resulting WTP estimates based on Eq. (6).

Reference Table. Estimation Results

	coeff. Est.	exp(coeff)	coeff.SE.	z value	WTP	conf. int.
K = T						
Const.	-0.172	0.842	0.068	-2.527 *		%
Corona dummy	0.067	1.069	0.040	1.660	0.60	[-0.12, 1.33]
Growth dummy	0.162	1.176	0.041	4.003 **	1.47	[0.76, 2.21]
Dist. dummy	0.266	1.305	0.040	6.601 **	2.41	[1.68, 3.15]
Next Gen. dummy	0.276	1.317	0.041	6.796 **	2.49	[1.78, 3.27]
Pension dummy	0.270	1.310	0.052	5.206 **	2.44	[1.53, 3.39]
M&N care dummy	0.225	1.252	0.052	4.319 **	2.03	[1.11, 2.98]
Energy dummy	0.151	1.163	0.040	3.738 **	1.36	[0.65, 2.11]
Tax increase	-0.111	0.895	0.005	-20.691 **		
LR test				608.6 **		
K = B						
Const.	-0.376	0.686	0.068	-5.570 **		%
Corona dummy	0.141	1.151	0.039	3.626 **	2.41	[1.09, 3.85]
Growth dummy	0.115	1.122	0.039	2.945 **	1.97	[0.65, 3.41]
Dist. dummy	0.342	1.407	0.039	8.728 **	5.84	[4.36, 7.67]
Next Gen. dummy	0.221	1.248	0.039	5.625 **	3.78	[2.42, 5.35]
Pension dummy	0.328	1.389	0.051	6.491 **	5.62	[3.84, 7.72]
M&N care dummy	0.304	1.356	0.051	6.000 **	5.20	[3.44, 7.27]
Energy dummy	0.141	1.152	0.039	3.629 **	2.42	[1.12, 3.86]
Deficit increase	-0.058	0.943	0.005	-11.480 **		
LR test				332.0 **		

注 : n = 15,000, Q # = 5,000 , * = significant at 5% , ** = significant at 1% .