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Is Japan's Milk Consumption Saturated?

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Consumers' decision has two stages. The first stage is whether or not to drink/eat the product. Then, the second stage is how much to drink/eat the products if they decide to drink/eat it. What factors affect the first stage decision as to whether or not to drink/eat the product? What factors affect the second stage decision as to how much to drink/eat the product? These will differ by stage and by product. Differences of affecting factors to consumers' two–stage decision by product could give us useful information to examine the tendency of fluid milk saturation and a possibility that decreases in fluid milk consumption could be replaced by increases in manufactured dairy products. With consumer survey data on consumption of fluid milk, yogurt drinks, yogurt, and cheese in Japan, the Heckman's two–step estimators of the Type II tobit model for each of the four products indicated that higher evaluation on milk utility and higher health concerns are more important determinants on how much to eat yogurt and cheese than on how much to drink fluid milk (including yogurt drinks). This would be an evidence of the fact that people with good images for milk are now increasing yogurt and cheese consumption instead of fluid milk, or that fluid milk consumption is replaced by yogurt and cheese. Because non–drinkers of fluid milk is already only about 10%, persuading current drinkers to drink more fluid milk is important. However, our estimation results indicate that there are few factors we could use to motivate them to increase fluid milk consumption because most factors are insignificant for deciding how much to drink fluid milk. This would be an evidence of saturation of fluid milk consumption in Japan.

INTRODUCTION

Japan's per capita annual fluid milk consumption is about 41 *kg*, which is about 40% of the U.S. level. Although the amount is still much lower than most Western countries, Japan's per capita fluid milk consumption has been stagnant in recent years. Some argue that Japan's fluid milk consumption will increase more in longer terms because about 60% of domestic milk supply is still used for fluid milk consumption in Japan. A high fluid utilization ratio is considered to be an indicator of shortage of fluid milk intake.

However, the figure, 60% is very misleading. In most Western countries, dairy imports are only around 5% of total domestic consumption, and the fluid utilization ratio of domestic milk production is almost equal to the fluid consumption share to total dairy consumption including imports. On the contrary, because about a half of consumption of manufactured dairy products (in raw milk equivalents) is met by imported products in Japan, the fluid utilization ratio of domestic milk production is much different from the fluid consumption share to total dairy consumption including imports. Although 60% of domestic milk supply is used for fluid consumption in Japan, the share of fluid milk to Japanese total dairy consumption (in raw milk equivalents) is already about 40%, which is close to the level of most Western countries.

The 4:6 consumption ratio of fluid and manufactured products is considered to be a threshold of saturation of fluid milk consumption as well as total dairy intake. Therefore, there is a possibility that Japanese fluid milk consumption is becoming saturated, and its recent stagnation might be a longer–term trend. There is also a possibility that any increases in manufactured dairy consumption such as yogurt, and cheese would be achieved by decreases in fluid milk consumption. Is Japan's total dairy consumption almost saturated although the absolute level of per capita consumption is still very low compared to Western countries? If so, this will be a very important message for the Japanese dairy industry to review the promotion strategies of dairy products in Japan.

In this paper, we examine the tendency of fluid milk saturation and a possibility that decreases in fluid milk consumption could be replaced by increases in manufactured dairy products using consumer survey data on consumption of fluid milk, yogurt drinks, yogurt, and cheese.

DATA AND METHOD

The data used in this study come from interviews conducted by the National Milk Promotion Association of Japan (NMPAJ) of Japanese consumers (aged 13 years and older) in 2002. Among 6,000 people chosen by random sampling, 4,277 individuals participated in the survey. Of the 4,277 respondents, we selected 3,069 persons aged between 20 and 64 years because we focused on working age population who usually earn income by themselves.

The survey covers the four products: fluid milk, yogurt drinks, yogurt, and cheese. From the survey results, for each of the four products, we can divide respondents into two categories: (1) a

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non-drinker/non-eater of the product, and (2) a drinker/eater of the product. Then, for drinkers/eaters of the product, we can get how much they drink/eat the products.

Consumers' decision has two stages. The first stage is whether or not to drink/eat the product. Then, the second stage is how much to drink/eat the products if they decide to drink/eat it. What factors affect the first stage decision as to whether or not to drink/eat the product? What factors affect the second stage decision as to how much to drink/eat the product? These will differ by stage and by product. Differences of affecting factors to consumers' two-stage decision by product could give us useful information to examine the tendency of fluid milk saturation and a possibility that decreases in fluid milk consumption could be replaced by increases in manufactured dairy products. This is our basic idea of this study.

The model to be used for estimation here is expressed as follows:

$$d_i^* = x_{1i}' \beta_1 + u_{1i} \quad (1)$$

$$Y_i^* = x_{2i}' \beta_2 + u_{2i} \quad (2)$$

$$d_i = 1 \quad \text{if} \quad d_i^* > 0 \quad (3)$$

$$d_i = 0 \quad \text{otherwise} \quad (4)$$

$$Y_i = Y_i^* \quad \text{if} \quad d_i = 1 \quad (5)$$

$$Y_i = 0 \quad \text{otherwise}, \qquad i = 1, 2, \ldots, n, \quad (6)$$

where d_i^* stands for whether or not to drink/eat the product. When $d_i^* > 0$, $d_i = 1$, which means he/she is a drinker/eater of the product, and otherwise $d_i = 0$, which means he/she is a non-drinker/non-eater of the product. Then, only when he/she is a drinker/eater of the product ($d_i = 1$), how much to drink/eat the product is decided by Y_i^*. x_{1i} and x_{2i} are vectors of explanatory variables that affect consumers' decision on whether or not to drink/eat the product and how much to drink/eat the product, respectively, β_1 and β_2 are vectors of parameters, u_{1i} and u_{2i} and are error terms. This is called Heckman's (1978) generalized tobit model (type II tobit), and it can be estimated with the Heckman's two stage method.

According to the NMPAJ survey results, 11% (331 persons) of the working age respondents (3,069 persons) are non-drinkers of fluid milk. About drinkers (2,738 persons), per capita fluid milk consumption per day is provided by eight categories as: less than 50 *ml*, about 50 *ml*, about 100 *ml*, about 200 *ml*, about 400 *ml*, about 600 *ml*, about 800 *ml*, and 1,000 *ml* or more in the survey. Distribution of respondents for each category is shown in Table 1. For our estimation, we approximated an average drinking volume for each category at 25 *ml*, 50 *ml*, 100 *ml*, 200 *ml*, 400 *ml*, 600 *ml*, 800 *ml*, and 1,200 *ml*, respectively.

According to the NMPAJ survey results, 40%, 15%, and 19% of the working age respondents (3,069 persons) are non-drinkers/non-eaters of yogurt drinks, yogurt, and cheese, respectively. About drinkers/eaters, per capita consumption of these three products is provided only by six frequency categories as: less than once a month, two or three days a month, one or two days a week, three or four days a week, five or six days a week, and everyday. Distribution of respondents for each category is shown in Table 2. Because it is difficult to calculate average consumption volumes of the products from these categories, we decided to apply 1, 2, 3, 4, 5, and 6, respectively, to each category. Large numbers means heavier drinkers/eaters of the products.

Table 1. Fluid Milk Consumption per Capita per Day

Category	Percentage
Zero	10.9
Less than 50 ml	6.1
About 50 ml	4.9
About 100 ml	14.8
About 200 ml	45.9
About 400 ml	11.1
About 600 ml	2.9
About 800 ml	0.8
1,000 ml and more	1.3
No answer	1.2
Total	100

Source: NMPAJ (2002).

Table 2. Frequency of Consumption of Yogurt Drinks, Yogurt, and Cheese

Category	Yogurt drinks	Yogurt	Cheese
Everyday	2.0	13.9	3.6
Five or six days a week	0.8	6.0	2.4
Three or four days a week	3.7	15.2	7.8
One or two days a week	8.5	20.4	20.0
Two or three days a month	17.4	17.2	25.7
Less than the above	24.4	11.7	20.2
Not drink/eat at all	40.4	15.0	19.0
No answer	2.6	0.7	1.3
Total	100	100	100

Source: NMPAJ (2002).

Twenty four explanatory variables are chosen from the survey.

IMP=How important is decision on what to drink in your life? (5=very important, 4=rather important, 3=important, 2=not so important, and 1=not important at all).

BALANCE=Is milk nutritionally well balanced? (1=yes, and 0=no).

SLEEP=Is drinking milk at night effective for sound sleep? (1=yes, and 0=no).

HEIGHT=Is milk effective to make children taller? (1=yes, and 0=no).

INTESTINE= Is milk lactose effective to reduce intestinal trouble? (1=yes, and 0=no).

BODY=Is milk effective to strengthen one's body? (1=yes, and 0=no).

CALCIUM=Is milk calcium easier to be absorbed into human body? (1=yes, and 0=no).

BONE=Is milk efficient to avoid osteoporosis? (1=yes,

and 0=no).
DIET=Is your diet healthy and nutritionally well balanced? (1=yes, and 0=no).
SUPPLEMENT=Are you often using dietary supplements? (1=yes, and 0=no).
BSE=Have you been stopping drinking/eating milk and dairy products due to the BSE problem? (1=yes, and 0=no).
BSERECOVER=Is your consumption of milk and dairy products recovered after a drop due to the BSE problem? (1=yes, and 0=no).
GENDER=gender (1=male, and 0=female).
AGE=age.
SELF=self-employment (1=yes, and 0=no).
MANAGE=managerial posts or profession (1=yes, and 0=no).
OFFICE=office worker (1=yes, and 0=no).
PLANT=plant worker (1=yes, and 0=no).
SERVICE=service worker (1=yes, and 0=no).
PART=part-time worker (1=yes, and 0=no).
BABY=living with infants (1=yes, and 0=no).
ELEM=living with elementary school children (1=yes, and 0=no).
HIGH=living with junior high school children (1=yes, and 0=no).
UNIV=living with university students (1=yes, and 0=no).
Distribution of respondents for each category is shown in Table 3.

Because we have multicollinearity problems when variables of the first and second stage regressions are all the same in using Heckman's two-stage method, we deleted some variables which have relatively high correlation ratios with other variables from the second stage regressions. The omitted variables are HEIGHT, BODY, BSE, and OFFICE. There are no price and income data in the survey. Because this is a cross-sectional survey, no price data is no problem. No income data is a problem, but this is limitation of an interview survey.

RESULTS

The Heckman's two-step estimators of the Type II tobit model for each of the four products are shown in Tables 4 to7. The conventional R^2 is meaningless in the first stage model because the dependent variable is binary. An alternative measure of goodness of fit is the count R^2, which is the percent of correct predictions within the sample (Maddala, 1992). The count R^2 for the four equations ranged from 0.64 (yogurt drinks) to 0.89 (fluid milk). For cross-sectional data, these values of R^2 are respectable. IMR is Inverse Mills Ratio used to check correlation of error terms between the first and second stage regressions (see Heckman, 1979). They are not significant for all cases, which means no problem.

Regarding whether or not to drink fluid milk, eight variables: IMP, BALANCE, SLEEP, DIET, BSE, BSERE-

Table 3. Description of the Explanatory Variables

Name	Description	Answer (%)
IMP	How important is decision on what to drink in your life?	Very important=13.8 Rather important=10.8 Important=47.3 Not so important=24.9 Not important at all=2.4 No answer=0.8
BALANCE	Is milk nutritionally well balanced?	Yes=75.6
SLEEP	Is drinking milk at night effective for sound sleep?	Yes=25.1
HEIGHT	Is milk effective to make children taller?	Yes=64.1
INTESTINE	Is milk lactose effective to reduce intestinal trouble?	Yes=18.0
BODY	Is milk effective to strengthen one's body?	Yes=16.6
CALCIUM	Is milk calcium easier to be absorbed into human body?	Yes=36.5
BONE	Is milk efficient to avoid osteoporosis?	Yes=57.6
DIET	Is your diet healthy and nutritionally well balanced?	Yes=49.5
SUPPLEMENT	Are you often using dietary supplements?	Yes=5.4
BSE	Have you been stopping drinking/eating milk and dairy products due to the BSE problem?	Yes=4.9
BSERECOVER	Is your consumption of milk and dairy products recovered after a drop due to the BSE problem?	Yes=18.1
GENDER	Gender (1=male, and 0=female)	Male=45.5
AGE	Age	Average=47.1 years old
SELF	Self-employment	Yes=12.9
MANAGE	Managerial posts or profession	Yes=15.9
OFFICE	Office worker	Yes=8.3
PLANT	Plant worker	Yes=5.8
SERVICE	Service worker	Yes=5.4
PART	Part-time worker	Yes=9.9
BABY	Living with infants	Yes=16.8
ELEM	Living with elementary school children	Yes=20.9
HIGH	Living with junior high school children	Yes=18.1
UNIV	Living with university students	Yes=11.0

Source: NMPAJ (2002).

COVER, GENDER, and AGE are significant at less than 10% level. In other words, the following type people tend to be fluid milk drinkers. They think that decision on what to drink is important in their life, milk is nutritionally well balanced, drinking milk at night is effective for sound sleep, their diet is healthy and nutritionally well balanced. Also, they did not stop drinking milk and dairy products due to the BSE problem, or their consumption of milk and dairy products recovered after a drop due to the BSE problem. Women and younger people tend to drink fluid milk.

Regarding how much to drink fluid milk, however, only two variables: IMP and SLEEP are significant at less than 10% level. The two factors are the degree to how important decision on what to drink is in their life and whether or not they think that drinking milk at night is effective for sound sleep.

Regarding yogurt drinks, the results are similar to fluid milk and worse in terms of the number of significant factors. First, about whether or not to drink yogurt drinks, six variables: SLEEP, INTESTINE, DIET, GENDER, AGE, and MANAGE are significant at less than 10% level. In other words, the following type people tend to be fluid milk drinkers. They think that drinking milk at night is effective for sound sleep, milk lactose is effective to reduce intestinal trouble, and their diet is healthy and nutritionally well balanced. Women, younger people, and managerial workers or professions tend to drink yogurt drinks. Then, regarding how much to drink yogurt drinks, only one variable, BSERECOVER, is significant. People whose consumption of milk and dairy products recovered after a drop due to the BSE problem tend to drink more yogurt drinks.

Thus, regarding the two fluid type products: fluid milk and yogurt drinks, most factors are not significant determinants on how much to drink them.

On the contrary, regarding two more solid-type dairy products: yogurt and cheese, much more factors are significant, especially in the second stage determinant. Firstly, regarding whether or not to eat yogurt, seven variables: BALANCE, SLEEP, BODY, DIET, BSERECOVER, GENDER, and AGE are significant at less than 10% level. In other words, the following type people tend to be yogurt eaters. They think that milk is nutritionally well balanced, drinking milk at night is effective for sound sleep, milk is effective to strengthen one's body, and their diet is healthy and nutritionally well balanced. Also, their consumption of milk and dairy products recovered after a drop due to the BSE problem. Women and younger people tend to eat yogurt.

Table 4. Fluid Milk Results

Explanatory Variables	Whether or not to drink		How much to drink	
	Coefficients	p-values	Coefficients	p-values
Constant	0.865	[.000]*	185.424	[.000]*
IMP	0.122	[.000]*	12.829	[.009]*
BALANCE	0.435	[.000]*	0.321	[.981]
SLEEP	0.193	[.039]*	19.782	[.033]*
HEIGHT	-0.016	[.846]	D	
INTESTINE	0.009	[.925]	11.312	[.188]
BODY	0.085	[.414]	D	
CALCIUM	0.051	[.561]	5.087	[.518]
BONE	0.039	[.609]	-11.969	[.119]
DIET	0.290	[.000]*	-0.709	[.950]
SUPPLEMENT	-0.083	[.518]	9.596	[.563]
BSE	-0.289	[.027]*	D	
BSERECOVER	0.405	[.000]*	5.774	[.657]
GENDER	-0.139	[.063]*	8.591	[.311]
AGE	-0.008	[.004]*	-0.256	[.499]
SELF	-0.013	[.904]	-3.894	[.725]
MANAGE	-0.024	[.816]	-0.543	[.954]
OFFICE	0.001	[.990]	D	
PLANT	0.091	[.511]	6.215	[.689]
SERVICE	0.028	[.841]	-11.696	[.391]
PART	0.041	[.718]	12.932	[.282]
BABY	-0.002	[.984]	-7.877	[.405]
ELEM	0.110	[.255]	-5.751	[.559]
HIGH	0.121	[.289]	-9.848	[.370]
UNIV	0.060	[.627]	7.573	[.563]
IMR			-0.222	[.824]
Log likelihood	-960.937		-18074.1	
Count R-squared	0.892			

Notes. IMR=Inverse Mills Ratio used to check correlation of error terms between the first and second stage regressions (see Heckman 1979).
D=a variable deleted to avoid multicollinearity.
*=significant at less than 10% level.
Stage 2's estimates are adjusted for heteroskedasticity using the White (1980) robust estimation procedure.

Table 5. Yogurt Drinks Results

Explanatory Variables	Whether or not to drink		How much to drink	
	Coefficients	p–values	Coefficients	p–values
Constant	0.995	[.000]*	1.660	[.000]*
IMP	0.000	[.990]	0.034	[.263]
BALANCE	0.070	[.189]	–0.009	[.902]
SLEEP	0.161	[.010]*	–0.049	[.680]
HEIGHT	0.016	[.792]	D	
INTESTINE	0.153	[.020]*	–0.008	[.951]
BODY	0.021	[.771]	D	
CALCIUM	0.005	[.937]	0.037	[.600]
BONE	–0.007	[.898]	0.035	[.594]
DIET	0.119	[.017]*	–0.004	[.967]
SUPPLEMENT	0.059	[.571]	–0.011	[.926]
BSE	0.126	[.265]	D	
BSERECOVER	0.017	[.776]	0.140	[.042]*
GENDER	–0.223	[.000]*	–0.151	[.318]
AGE	–0.019	[.000]*	0.008	[.528]
SELF	0.027	[.738]	0.122	[.221]
MANAGE	0.154	[.042]*	0.045	[.689]
OFFICE	0.090	[.301]	D	
PLANT	–0.016	[.878]	0.194	[.115]
SERVICE	–0.027	[.791]	–0.040	[.714]
PART	0.038	[.638]	–0.025	[.768]
BABY	–0.100	[.154]	–0.081	[.406]
ELEM	–0.036	[.591]	–0.061	[.417]
HIGH	0.062	[.426]	–0.150	[.133]
UNIV	0.105	[.226]	–0.046	[.692]
IMR			–0.057	[.955]
Log likelihood	–1965.47		–2978.78	
Count R–squared	0.635			

Notes. IMR is Inverse Mills Ratio used to check correlation of error terms between the first and second stage regressions (see Heckman 1979).
D=a variable deleted to avoid multicollinearity.
*=significant at less than 10% level.
Stage 2's estimates are adjusted for heteroskedasticity using the White (1980) robust estimation procedure.

Then, regarding how much to eat yogurt, eight variables: IMP, CALCIUM, DIET, BSERECOVER, GENDER, SELF, PLANT, and ELEM are significant at less than 10% level. In other words, the following type people tend to be heavier yogurt eaters. They think that decision on what to drink is important in their life, milk calcium is easier to be absorbed into human body, and their diet is healthy and nutritionally well balanced. Also, their consumption of milk and dairy products recovered after a drop due to the BSE problem. Women tend to eat yogurt more. Self–employees, plant workers, and persons living with elementary school children tend to eat lesser yogurt.

Regarding whether or not to eat cheese, eleven variables: IMP, SLEEP, INTESTINE, CALCIUM, DIET, BSERECOVER, GENDER, AGE, MANAGE, BABY, and ELEM are significant at less than 10% level. In other words, the following type people tend to be cheese eaters. They think that that decision on what to drink is important in their life, drinking milk at night is effective for sound sleep, milk lactose is effective to reduce intestinal trouble, and their diet is healthy and nutritionally well balanced. Also, their consumption of milk and dairy products recovered after a drop due to the BSE problem. Women, managerial workers or professions, persons living with babies, and persons living with elementary school children tend to eat cheese.

Then, regarding how much to eat cheese, seven variables: IMP, BALANCE, INTESTINE, CALCIUM, DIET, GENDER, SELF, PLANT, and BABY are significant at less than 10% level. In other words, the following type people tend to be heavier cheese eaters. They think that decision on what to drink is important in their life, milk is nutritionally well balanced, milk lactose is effective to reduce intestinal trouble, milk calcium is easier to be absorbed into human body, and their diet is healthy and nutritionally well balanced. Also, their consumption of milk and dairy products recovered after a drop due to the BSE problem. Women and persons living with babies tend to eat more cheese.

Note that higher evaluation on milk utility and higher health concerns are more important determinants on how much to eat yogurt and cheese than on how much to drink fluid milk (including yogurt drinks). This would be an evidence of the fact that people with good images for milk are now increasing yogurt and cheese consumption instead of fluid milk, or that fluid milk consumption is replaced by yogurt and cheese.

Because non–drinkers of fluid milk is already only about 10%, persuading current drinkers to drink more

Table 6. Yogurt Results

Explanatory Variables	Whether or not to eat		How much to eat	
	Coefficients	p–values	Coefficients	p–values
Constant	1.778	[.000]*	2.629	[.000]*
IMP	0.042	[.167]	0.085	[.010]*
BALANCE	0.119	[.085]*	0.083	[.242]
SLEEP	0.348	[.000]*	0.118	[.263]
HEIGHT	0.094	[.227]	D	
INTESTINE	n.a.		n.a.	
BODY	0.202	[.041]*	D	
CALCIUM	–0.046	[.556]	0.123	[.095]*
BONE	–0.011	[.873]	–0.008	[.905]
DIET	0.265	[.000]*	0.326	[.000]*
SUPPLEMENT	–0.037	[.773]	0.014	[.916]
BSE	–0.051	[.715]	D	
BSERECOVER	0.199	[.021]*	0.166	[.046]*
GENDER	–0.513	[.000]*	–0.634	[.000]*
AGE	–0.018	[.000]*	0.007	[.128]
SELF	–0.091	[.314]	–0.243	[.017]*
MANAGE	0.035	[.680]	–0.070	[.404]
OFFICE	n.a.		n.a.	
PLANT	–0.084	[.457]	–0.426	[.001]*
SERVICE	n.a.		n.a.	
PART	n.a.		n.a..	
BABY	–0.058	[.543]	–0.129	[.114]
ELEM	0.109	[.247]	–0.145	[.068]*
HIGH	0.098	[.375]	–0.082	[.415]
UNIV	n.a.		n.a.	
IMR			1.312	[.190]
Log likelihood	–1066.14		–4955.99	
Count R–squared	0.872			

Notes. IMR is Inverse Mills Ratio used to check correlation of error terms between the first and second stage regressions (see Heckman 1979).
D=a variable deleted to avoid multicollinearity.
*=significant at less than 10% level.
n.a.=not available because all respondents chose yes or no.
Stage 2's estimates are adjusted for heteroskedasticity using the White (1980) robust estimation procedure.

fluid milk is important. However, our estimation results indicate that there are few factors we could use to motivate them to increase fluid milk consumption because most factors are insignificant for deciding how much to drink fluid milk. This would be an evidence of saturation of fluid milk consumption in Japan. Regarding drink yogurts, the situation is a bit different from fluid milk in that making more drinkers might be still possible because 40% respondents are currently non–drinkers of yogurt drinks.

CONCLUSIONS

Consumers' decision has two stages. The first stage is whether or not to drink/eat the product. Then, the second stage is how much to drink/eat the products if they decide to drink/eat it. What factors affect the first stage decision as to whether or not to drink/eat the product? What factors affect the second stage decision as to how much to drink/eat the product? These will differ by stage and by product. Differences of affecting factors to consumers' two–stage decision by product could give us useful information to examine the tendency of fluid milk saturation and a possibility that decreases in fluid milk consumption could be replaced by increases in manufactured dairy products. This was our basic idea of this study. We used consumer survey data on consumption of fluid milk, yogurt drinks, yogurt, and cheese in Japan.

The Heckman's two–step estimators of the Type II tobit model for each of the four products indicated that higher evaluation on milk utility and higher health concerns are more important determinants on how much to eat yogurt and cheese than on how much to drink fluid milk (including yogurt drinks). This would be an evidence of the fact that people with good images for milk are now increasing yogurt and cheese consumption instead of fluid milk, or that fluid milk consumption is replaced by yogurt and cheese.

Because non–drinkers of fluid milk is already only about 10%, persuading current drinkers to drink more fluid milk is important. However, our estimation results indicate that there are few factors we could use to motivate them to increase fluid milk consumption because most factors are insignificant for deciding how much to drink fluid milk. This would be an evidence of saturation of fluid milk consumption in Japan.

Table 7. Cheese Results

Explanatory Variables	Whether or not to eat		How much to eat	
	Coefficients	p–values	Coefficients	p–values
Constant	0.930	[.000]*	1.549	[.000]*
IMP	0.052	[.063]*	0.091	[.008]*
BALANCE	0.078	[.218]	0.115	[.047]*
SLEEP	0.268	[.001]*	0.124	[.227]
HEIGHT	–0.013	[.859]	D	
INTESTINE	0.161	[.053]*	0.162	[.045]*
BODY	0.042	[.639]	D	
CALCIUM	0.133	[.073]*	0.177	[.017]*
BONE	–0.061	[.352]	–0.048	[.431]
DIET	0.197	[.001]*	0.246	[.005]*
SUPPLEMENT	0.001	[.991]	0.023	[.824]
BSE	0.098	[.464]	D	
BSERECOVER	0.132	[.082]*	0.066	[.363]
GENDER	–0.199	[.002]*	–0.216	[.014]*
AGE	–0.009	[.000]*	0.003	[.491]
SELF	0.027	[.776]	–0.065	[.447]
MANAGE	0.176	[.052]*	–0.076	[.382]
OFFICE	0.077	[.449]	D	
PLANT	0.043	[.715]	–0.146	[.146]
SERVICE	0.096	[.432]	–0.064	[.531]
PART	0.101	[.300]	–0.036	[.672]
BABY	0.185	[.040]*	0.199	[.024]*
ELEM	0.224	[.011]*	0.012	[.897]
HIGH	0.160	[.110]	0.029	[.749]
UNIV	0.022	[.832]	–0.100	[.235]
IMR			1.017	[.309]
Log likelihood	–1296.76		–4148.68	
Count R–squared	0.836			

Notes. IMR is Inverse Mills Ratio used to check correlation of error terms between the first and second stage regressions (see Heckman 1979).
D=a variable deleted to avoid multicollinearity.
*=significant at less than 10% level.
Stage 2's estimates are adjusted for heteroskedasticity using the White (1980) robust estimation procedure.

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