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Welfare Analysis of Agricultural Policies Using Complete Demand Systems for Different Representative Households in the U.S.

The welfare impacts of two agricultural policy scenarios on twelve different representative households in the United States are evaluated using the Almost Ideal Demand System(AIDS) for foods and beverages. The government policy scenarios examined are possible imposition of a sin tax on alcoholic beverages and possible elimination of the price support program for dairy industry. Both methodology and results may be useful for policy makers, policy analysts, and consumer interests.

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Introduction

Government agricultural policies such as taxation and price support programs often result in changes in the market prices of food and beverages. These price changes may benefit or adversely affect consumers of food and beverages. Therefore, it is important to measure and assess these welfare changes, i.e., to examine the money metric degree of impacts of agricultural policies on the consuming public.

In general, the measurement of welfare change for an individual household due to market price changes can be theoretically carried out by computing the exact money metric compensating variation(CV) or equivalent variation(EV)(Hicks, 1942; Boadway and Bruce, 1984). Normally, the CV and EV can be calculated based on an expenditure function, but the integrability from demand functions to the expenditure function often causes theoretical and empirical difficulties(Chern,1991), especially in the case of a single equation with multiple price determinants. In dealing with these difficulties, Chipman and Moore(1980), Hausman(1981), King(1983), Randall and Stoll(1980), Vartia(1983), and Willig(1976) have made considerable contributions in calculating the CV and EV using the Marshallian consumer's surplus measures. Recently, LaFrance(1991) has advocated the use of an incomplete demand system to deal with this measurement problem. In fact, many commonly used complete demand systems have their well defined expenditure functions and indirect utility functions which can be used to calculate the exact CV or EV (Chern,1991). However, there exist very few empirical applications in which a complete demand system is used to obtain the money metric welfare change.

The objective of this paper is to evaluate the welfare changes for different representative households under two agricultural policy scenarios, which are possible imposition of a sin tax on alcoholic beverages and possible elimination of price support program for the dairy industry. A well defined expenditure function in the Almost Ideal Demand System(AIDS)(Deaton and Muellbauer, 1980) for food and beverage consumption will be used to calculate the exact welfare change measures of CV and EV for twelve different representative households, which are defined as having different household compositions, different income levels, and different races. The monthly expenditure data(January 1980 to December 1990) of different representative households for twenty aggregate commodities of food and beverages are calculated from the public use tapes of BLS's Consumer Expenditure (Diary) Survey. These data are combined with monthly data of corresponding Consumer Price Index(CPI) to estimate the AIDS models for different representative households.

The paper is arranged as follows: (a)procedures of calculating CV and EV using the AIDS model and the definition of price elasticity of welfare; (b)data and classification of representative households; (c)discussion of model estimation; (d)evaluation of welfare changes to different representative households under the two policy scenarios; and (e)conclusion.

Measuring Welfare Changes with the AIDS Model

In the AIDS model, the expenditure function, $e(\mathbf{p},u)$, is defined as

$$\log\{e(\mathbf{p},u)\} = (1-u)\log\{a(\mathbf{p})\} + u\log\{b(\mathbf{p})\} \quad (1)$$

where $\mathbf{p}$ is a price vector; $a(\mathbf{p})$ and $b(\mathbf{p})$are positive linearly homogeneous function in $\mathbf{p}$; u is a utility level which may take a number between 0 (subsistence) and 1 (bliss) so that $a(\mathbf{p})$ and $b(\mathbf{p})$ can be regarded as the expenditures of subsistence and bliss, respectively. Equation (1) represents a specific class of preference, the "price-independent generalized linear logarithm" (PIGLOG)(Muellbauer 1975,1976), which permits exact aggregation over households, i.e., the representation of market demands as if they were the outcome of decisions by a rational representative household.

Given specific functional forms for $\log\{a(\mathbf{p})\}$ and $\log\{b(\mathbf{p})\}$(Deaton and Muellbauer,1980), the expenditure function can be written aspercentage changes in welfare based

$$\log\{e(\mathbf{p},u)\} = \alpha_0 + \Sigma\,\alpha_k \log p_k + (1/2)\Sigma\Sigma\,\gamma_{kj}\log p_k \log p_j + u\,\beta_0\Pi(p_k)^{\beta k} \qquad (2)$$

where p_k is the price of kth commodity consumed by the household; α_k, β_k, and γ_{kj} are parameters. In order to meet the requirements that $a(\mathbf{p})$, $b(\mathbf{p})$, and $e(\mathbf{p},u)$ are linearly homogeneous in $\mathbf{p}$, the parameters should satisfy: $\Sigma\,\alpha_k=1$, $\Sigma\,\gamma_{kj} = \Sigma\,\gamma_{jk}= \Sigma\,\beta_k =0$. Also, the symmetry of the second derivative of $\log\{e(\mathbf{p},u)\}$ with respect to p_k and p_j requires $\gamma_{kj} = \gamma_{jk}$.

Using the duality theory, the Marshallian demand functions in budget share form can be derived as

$$w_i = \alpha_i + \Sigma\,\gamma_{ij}\log p_j + \beta_i \log(m/P^*) \qquad (3)$$

where w_i is budget share of ith commodity; m is total expenditure for the household; P* is a price index and can be approximated by the Stone price index(Deaton and Muellbauer,1980).

The indirect utility function can be obtained based on equation(2):

$$u = V(\mathbf{p},m) = \{\log m - \alpha_0 - \Sigma\alpha_k \log p_k - (1/2)\Sigma\Sigma\,\gamma_{kj}\log p_k \log p_j\}/\{\beta_0\Pi(p_k)^{\beta k}\} \qquad (4)$$

For the CV and EV calculation, we can use the estimated results of equation (3), i.e., α_i, γ_{ij}, and β_i, which are estimated based on observed data, w_i, p_i, and m.

Given a starting point $(\mathbf{p}^0, m^0)$ and an ending point $(\mathbf{p}^1, m^1)$ of income change and price changes, equation (4) can be used to calculate $u^0 = V(\mathbf{p}^0, m^0)$ and $u^1 = V(\mathbf{p}^1, m^1)$. Then , equation (2) can be used to calculate $\log e(\mathbf{p}^0,u^0)$, $\log e(\mathbf{p}^1,u^0)$, $\log e(\mathbf{p}^0,u^1)$, and $\log e(\mathbf{p}^1,u^1)$, where, as we know, $m^0 = e(\mathbf{p}^0,u^0)$ and $m^1 = e(\mathbf{p}^1,u^1)$. Finally, the CV and EV can be calculated as follows:

$$CV = m^1 - e(\mathbf{p}^1,u^0) = m^1 - \exp\{\log e(\mathbf{p}^1,u^0)\} \qquad (5)$$

and

$$EV = e(\mathbf{p}^0,u^1) - m^0 = \exp\{\log e(\mathbf{p}^0,u^1)\} - m^0. \qquad (6)$$

Also, we can calculate the on the total expenditure of starting point, i.e.,

$$pcv = CV/m^0 \qquad (7)$$

where pcv is percentage change of welfare with CV. And, we can define a so-called welfare-price elasticity (or price elasticity of welfare) as:

$$e_{iw} = pcv/(\Delta p_i/p_i) \qquad (8)$$

or

$$e_{gw} = pcv/(\Delta p_g/p_g) \qquad (9)$$

where e_{iw} or e_{gw} is the price elasticity of welfare due to a percent change in the price of commodity i $(\Delta p_i/p_i)$ or in the prices of a commodity group g $(\Delta p_g/p_g)$. Normally, e_{iw} or e_{gw} should have a negative sign which means welfare decreases as the price(s) of a commodity(or commodity group) increases. But, a positive sign may exist when the effects of substitutes and/or compliments of the commodity(or commodities of the group) are very strong, a special reason for using a complete demand system.

To calculate CV and EV, the estimates of α_0 and β_0 have to be obtained first. Unfortunately, they can not be derived from equation (3). According to Deaton and Muellbauer(1980), since α_0 can be interpreted as the outlay required for a minimal standard of living when prices are unity, it is possible to assign a plausible value to α_0 a priori. In fact, α_0 and β_0 should be a pair of adjustment parameters, which adjust the range of u based on equation (4) after the other estimated parameters are derived. Therefore, α_0 and β_0 can be selected on the basis that u lies between 0 and 1. If α_0 and β_0 are arbitrarily chosen, u will not have the values between 0 and 1, but u will hold its ordinary preference for the same representative household. In this paper, we choose $\alpha_0 = 0$ and $\beta_0 = 1$.

Data and Representative Households

The expenditure data used in this study are

obtained from the Consumer Expenditure Survey(CES) which has been continuously conducted by the Bureau of Labor Statistics each year since 1980. The CES survey includes two components: quarterly interview panel survey for major consumption commodities(goods and services) and the weekly dairy survey on frequently purchased items such as food and beverages. Only expenditure data associated with other social demographic variables for each household are documented in the CES survey(also in survey tapes). This study covers 11 years of the diary CES surveys from 1980 to 1990. There are more than ten thousands of observations each year(see Table 1). In order to correctly classify households using income level, we delete those households with zero or negative income(before taxes), so that the numbers of households used for this study are reduced as shown in Table 1.

Table 1
Sample Size in the CES(Diary) Survey

Year	Households Surveyed	Households With Positive Income
1980	10,433	8,810
1981	10,547	8,695
1982	10,927	9,224
1983	10,792	9,169
1984	11,873	9,925
1985	11,619	9,797
1986	12,817	10,957
1987	13,098	11,227
1988	11,413	9,727
1989	11,470	9,787
1990	11,651	9,952

Because of these huge numbers of observations, it is computationally cumbersome to use the pooled cross-sectional and time-series data from the CES survey. Hence, for the purpose of this study, we classify households into different representative households and then calculate average weekly expenditures by month(time-series data) for each representative household.

Table 2
Definitions and Features of Representative Households

Type	Definition	Average Monthly Sample Size	Average Annual Income,$	Average Weekly Food Expense,$	Average Household Size
FAMT1	Single person only	231(65)	13288(3147)	36.04(6.40)	1.00(0.00)
FAMT2	Husband & wife only	171(51)	27288(5661)	65.90(9.95)	2.00(0.00)
FAMT3	Single parent with at least 1 child	49(14)	13862(3230)	53.13(12.1)	2.99(0.25)
FAMT4	Husband & wife with at least 1 child	185(52)	31737(6465)	84.47(12.6)	3.97(0.10)
FAMT5	All other structures	176 (46)	28483(5679)	101.37(11.2)	3.64(0.19)
INGP1	1st income group(25%)	202 (53)	4308(1087)	38.46(7.8)	1.94(0.18)
INGP2	2nd income group(25%)	203 (53)	13242(2792)	52.19(8.55)	2.37(0.14)
INGP3	3rd income group(25%)	203 (53)	25482(4907)	70.58(9.77)	2.80(0.15)
INGP4	4th income group(25%)	205 (53)	51694(10831)	98.04(13.6)	3.20(0.14)
RACE1	White household head	700(185)	24633(4902)	66.71(8.87)	2.54(0.09)
RACE2	Black household head	87(24)	16033(4146)	47.42(10.3)	2.78(0.29)
RACE3	Household head with other races	26 (10)	27120(8282)	77.86(21.0)	3.19(0.55)
TOTAL	All households	812(212)	23790(4829)	64.95(8.92)	2.58(0.09)

Note: The numbers in the parentheses are standard errors; RACE3 is not considered in the study because of a small monthly sample size and a relatively large standard error.

To effectively differentiate and classify all households in the U.S., three demographic factors are considered, i.e., household composition, household income level, and race of household head, because they have more significant effects on the demand of food and beverages than others.

Based on information of family type and number of children under 18 years old in the CES survey tapes, five types of household compositions are classified: households with single person only(FAMT1); households with husband and wife only(FAMT2); households with a single parent who has at least one child under 18 years old(FAMT3); households with husband and wife who have at least one child under 18 years old(FAMT4); and households of all other compositions(FAMT5).

Using the relative household income(before taxes) levels in the monthly sample, four representative households are considered in this study: first group of households(25% in monthly sample) with lowest income; second group of households(25%) with lower-middle income; third group of households(25%) with upper-middle income; and fourth group of households(25%) with highest income. For convenience, INGP1, INGP2, INGP3, and INGP4 are used to denote these four types of representative households, respectively.

The information of household head's race are used to classify households into three representative households: White; Black; and other races. The symbols, RACE1, RACE2, and RACE3 are given to represent these three types of households. However, RACE3 will not be considered in this study because it has very small monthly sample sizes (see Table 2).

Finally, an overall representative household is constructed based on information of all households to capture the characteristics of all households of U.S. The 'TOTAL' is given to represent the overall representative household.

For each representative household, the average monthly data are calculated based on the CES survey tapes(1980-1990). The monthly data include weekly expenditures of twenty major groups of food & beverages, which are listed in the first column in Table 3 and denoted as x_i (i =1, 20). To account for the prices of twenty commodities of food and beverages, the corresponding consumer price indexes (CPI) are obtained from the BLS's Consumer Price Index tape. The base year of the CPIs is 1982-84. We assume each representative household faces the same price(CPI) series.

Estimation

For different representative households in the U.S., the welfare changes due to changes in the price of food and beverage may be different because different representative households may have different demand (functions) or preferences for food and beverages. In this study, we assume that different representative households have the same demand specification but different parameters to account for their different preferences.

In order to apply the AIDS model, we assume a specific representative household make consumption decisions using a two-stage maximization (Pollak,1971). In the first stage, the representative household allocates its income among food & beverages and other non-food items, and in the second stage, the budget for food and beverages is allocated to twenty foods and beverages. The budget constraint in the second stage can be expressed as $\Sigma\, p_i x_i = m$, where m is total food and beverage expenditure.

The theoretical AIDS model in equation (3) is modified by adding three seasonal dummy variables(one for the months of 2nd quarter, one for the months of 3rd quarter, and the other for the months of 4th quarter), and four structural dummy variables (one for the months in 1982-83, one for the months in 1984-85, one for the months in 1986-88, and the other for the months in 1989-90) for capturing the possible structural changes of food and beverage consumption in the U.S. As usually done, the lagged Stone price index (i.e. $\Sigma\, w_{i(t-1)} \log p_{it}$) is used to replace P* in the AIDS model(i.e., LA/AIDS model). Also, the homogeneity and symmetry restrictions are imposed in model estimation.

Using the data set ($p_i x_i$, p_i, i =1,20, and m) of each representative household, the AIDS model is estimated separately for each representative group. The majority of estimated parameters for each representative household are statistically significant, and the majority of own-price elasticities of 20 foods are negative. Due to space limitation , the regression results can not be all presented here, but they are available by request from the authors (All estimations and the following calculations of CVs and EVs are done by SAS in a mainframe computer, and the nonlinear ITSUR method is used to estimate the AIDS model).

Table 3
Selected Results of Estimation for Overall Representative Household

Variable	Mean ($)	Share (%)	Expenditure Elasticity	Own-price Elasticity	Adj. R^2	D-W
x_1, Cereals	1.88	2.74	0.532	-0.998	0.692	2.344
			(0.41)	(0.31)	(0.117)	(0.819)
x_2, Bakery	3.75	5.50	0.651	-1.614	0.454	2.440
			(0.58)	(0.33)	0.084)	(1.029)
x_3, Beef	4.08	6.11	0.658	-0.969	0.740	2.443
			(0.51)	(1.24)	(0.178)	(0.331)
x_4, Pork	2.36	3.52	1.104	-0.923	0.569	1.853
			(0.31)	(0.61)	(0.196)	(0.216)
x_5, Other meat	1.66	2.46	0.881	-3.578	0.490	2.003
			(0.19)	(0.28)	(0.149)	(-0.815)
x_6, Poultry	1.70	2.51	0.473	-0.746	0.393	2.719
			(0.28)	(0.34)	(0.186)	(0.241)
x_7, Seafood	1.28	1.87	1.349	-2.493	0.258	2.313
			(0.23)	(0.23)	(0.194)	(0.543)
x_8, Eggs	0.62	0.93	0.578	-0.290	0.846	2.034
			(0.08)	(0.20)	(0.152)	(0.088)
x_9, Fluid milk	2.56	3.79	0.529	-1.077	0.721	2.105
			(0.20)	(0.37)	(0.097)	(0.530)
x_{10},Other dairy	2.67	3.93	0.796	-1.108	0.033	1.854
			(0.35)	(0.25)	(0.144)	(1.201)
x_{11},Fresh fruits	2.04	2.99	1.239	-0.640	0.498	1.901
			(0.48)	(0.50)	(0.203)	(0.038)
x_{12},Fresh vegetables	1.98	2.90	0.845	-0.450	0.352	1.839
			(0.34)	(0.27)	(0.130)	(0.087)
x_{13},Pro. fruits	1.51	2.22	0.726	-1.031	0.225	2.206
			(0.23)	(0.18)	(0.128)	(0.349)
x_{14},Pro. vegetables	1.11	1.64	0.462	-0.612	0.579	2.137
			(0.18)	(0.21)	(0.156)	(0.566)
x_{15},Sweets	1.50	2.21	0.974	0.302	0.466	2.624
			(0.36)	(0.47)	(0.282)	(0.662)
x_{16},Fats & oils	1.08	1.60	0.484	0.116	0.657	2.454
			(0.12)	(0.16)	(0.112)	(0.336)
x_{17},Nonalc.bev.	3.66	5.39	0.751	-0.904	0.321	1.901
			(0.50)	(0.40)	(0.110)	(0.321)
x_{18},Misc. food	4.71	6.83	0.662	-1.883	0.828	2.345
			(1.16)	(0.93)	(0.105)	(1.162)
x_{19},Food away	22.26	32.47	1.304	-1.489	0.658	2.061
			(4.43)	(2.89)	(0.092)	(0.736)
x_{20},Alc. bev.	5.63	8.37	1.569	-2.679	-------	------
			(0.80)	(1.37)	-------	------

Note: The numbers in the parentheses are estimated standard errors. D-W is Durbin-Watson statistics.

In this paper, only selected estimation results for the overall representative household are given in Table 3. As one can see, the own-price elasticities of most commodities are negative and statistically significant except for sweets(x_{15}) and fats & oils(x_{16}), which are statistically insignificant. The expenditure elasticities indicate that all commodities are normal goods while pork, seafood, fresh fruits, food away from home, and alcoholic beverages have an expenditure elasticity greater than unity. The Durbin-Watson statistics show that either no or very weak autocorrelation exists. In addition, the estimated seasonal coefficients (not reported here) for beef, pork, other meats, and fresh milk are statistically insignificant; and the estimated structural coefficients for cereals, poultry, other dairy products, fresh fruits, fresh vegetables, fats & oils, and nonalcoholic beverages are not statistically significant. All other estimates of seasonal and structural coefficients are significant.

Overall, the estimated results for the representative household are mostly consistent with those of several previous studies using complete food demand systems (e.g., Heien,1982; Huang and Haidacher, 1983). For the models of other representative households, the results of estimation are similar to those of the overall representative household in terms of statistical significance.

Policy Scenarios and Welfare Changes

Two agricultural policy alternatives are considered in this paper: (a) Possible elimination of price support program for dairy products(Scenario A). If the support program is eliminated, the market prices of dairy products(x_9 and x_{10}) will decrease to match the competitive equilibrium prices. According to previous studies(LaFrance, 1991; Dardis and Bedore,1990), the percentage of price falls will be in the range of 10% to 20%. Here, three possible consequences are considered: 5%, 10%, and 20% of price falls for the two dairy products included in the model. (b) Possible imposition of a new alcoholic beverage tax(Scenario B). This is the so-called 'sin' tax policy, by which the government hopes to reduce the budget deficit and justifies this policy on the basis that alcoholic beverages(x_{20}) are 'sin' luxury goods. Three possible increases of alcoholic beverage prices resulting from this tax are considered: 1%, 5%, and 10%.

The baseline for computing and comparing the welfare changes due to the two possible policy scenarios is constructed on the historical average levels of total food and beverage expenditures, m , for each representative household and the historical average CPI levels of twenty commodities of food and beverages. In the following calculation of welfare changes, we assume total food and beverage expenditure of each representative household is unchanged but price (CPI) levels change from average level to a new level that is resulted from a specific scenario.

Table 4
Welfare Changes under Scenario A($ per week, value of 1982-84)

Type of Household (m)	Mean	Decrease 5%			Decrease 10%			Decrease 20%		
	($)	CV($)	pcv(%)	e_w	CV($)	pcv(%)	e_w	CV($)	pcv(%)	e_w
FAMT1	36.04	0.18	0.50	-0.099	0.37	1.03	-0.103	0.79	2.19	-0.109
FAMT2	65.90	0.79	1.20	-0.241	1.62	2.46	-0.246	3.40	5.16	-0.258
FAMT3	53.13	1.30	2.46	-0.491	2.62	4.94	-0.494	5.31	9.99	-0.499
FAMT4	84.47	1.59	1.89	-0.377	3.25	3.85	-0.385	6.80	8.05	-0.403
FAMT5	101.37	4.13	4.07	-0.815	8.28	8.17	-0.817	16.67	16.45	-0.822
INGP1	38.46	0.06	0.14	-0.029	0.12	0.31	-0.031	0.27	0.71	-0.036
INGP2	52.19	0.80	1.54	-0.308	1.63	3.12	-0312	3.37	6.46	-0.323
INGP3	70.58	0.89	1.26	-0.253	1.81	2.57	-0.257	3.74	5.30	-0.265
INGP4	98.04	2.03	2.07	-0.414	4.13	4.21	-0.421	8.56	8.73	-0.437
RACE1	66.71	0.87	1.31	-0.262	1.78	2.67	-0.267	3.73	5.59	-0.280
RACE2	47.42	1.05	2.21	-0.442	2.14	4.52	-0.452	4.49	9.46	-0.473
TOTAL	64.95	0.98	1.50	-0.301	1.99	3.07	-0.307	4.17	6.42	-0.321

Table 5
Welfare Changes under Scenario B ($ per week, value of 1982-84)

Type of Household (m)	Mean	Increase 1%			Increase 5%			Increase 10%		
	($)	CV($)	pcv(%)	e_w	CV($)	pcv(%)	e_w	CV($)	pcv(%)	e_w
FAMT1	36.04	-0.06	-0.16	-0.159	-0.27	-0.75	-0.150	-0.51	-1.40	-0.140
FAMT2	65.90	-0.41	-0.63	-0.629	-2.08	-3.16	-0.632	-4.19	-6.36	-0.636
FAMT3	53.13	-0.04	-0.08	-0.078	-0.17	-0.33	-0.065	-0.27	-0.50	-0.050
FAMT4	84.47	+0.27	+0.32	+0.316	+1.29	+1.53	+0.306	+2.49	+2.95	+0.295
FAMT5	101.37	-0.34	-0.33	-0.332	-1.78	-1.76	-0.352	-3.81	-3.75	-0.375
INGP1	38.46	+0.19	+0.49	+0.489	+0.93	+2.41	+0.482	+1.82	+4.73	+0.473
INGP2	52.19	-0.17	-0.33	-0.332	-0.90	-1.72	-0.344	-1.87	-3.58	-0.358
INGP3	70.58	-0.50	-0.71	-0.707	-2.47	-3.51	-0.701	-4.91	-6.95	-0.695
INGP4	98.04	-0.27	-0.27	-0.273	-1.36	-1.39	-0.278	-2.79	-2.85	-0.285
RACE1	66.71	-0.13	-0.20	-0.199	-0.66	-0.99	-0.198	-1.30	-1.96	-0.196
RACE2	47.42	-0.20	-0.42	-0.424	-1.02	-2.15	-0.430	-2.07	-4.37	-0.437
TOTAL	64.95	-0.14	-0.22	-0.216	-0.71	-1.09	-0.218	-1.42	-2.19	-0.219

Based on the results of estimation from the AIDS models, the welfare changes of CV and EV for each representative household under two policy scenarios can be calculated and compared as follows(The values of EV are not presented in the tables because of space limitation. In all cases, EVs are slightly smaller than the corresponding CVs in absolute values.).

Welfare changes under Scenario A

Table 4 shows the estimated welfare changes under Scenario A. The results indicate that the elimination of price support program for dairy products has different welfare effects for different representative households in terms of both CVs and price elasticities of welfare. For example, the households with children or more members such as FAMT3, FAMT4, and FAMT5, will have a larger welfare gain due to the price falls of dairy products because they may consume more dairy products than other households and have higher total food & beverage expenditures. The households with higher income also have higher gains from the price changes because higher income households also consume more dairy products than lower income households. However, the black household receives more benefit from this policy scenario than the white household although black household has lower income as well as lower food & beverage expenditure. It may be resulted by higher black household's own-price elasticity of demand for dairy products. With respect to the price elasticities of welfare, the black household has higher values than white household. It means that the welfare of black household is more sensitively affected by price changes of dairy products. Among the households with different income, the welfare change of lowest income household is nearly perfectly inelastic with respect to price change. For different household compositions, FAMT5(more members) has the highest elasticity(-0.82), FAMT1(single) has the lowest elasticity(-0.10), and FAMT3 & FAMT4(with children) have higher but FAMT2(married couple only) has lower elasticities than that of TOTAL(-0.31).

Welfare changes under Scenario B

The welfare changes under scenario B are calculated in Table 5. For this scenario, the welfare changes exhibit either gains or losses for different representative households.

FAMT4(more members with children) and INGP1(lowest income) have positive price elasticities of welfare, implying that they will be better off when the price of alcoholic beverage increases because they tend to substitute other food and nonalcoholic beverages for alcoholic beverages. Among other household compositions, FAMT2(couple) has the highest elasticity(-0.63), while FAMT3(single parent with children) has the lowest elasticity(-0.07). It may be concluded that the households without children may suffer more loss from this policy scenario. For other three different income households, INGP3 has highest elasticity(-0.70), while INGP4 has lowest elasticity(-0.28), i.e., the middle income households will be more affected by the tax increase. Compared to the white household, the black household has a higher elasticity, so that the alcoholic beverage tax may have greater impact on the black than the white because the former may consume more alcoholic beverages.

Conclusion

In this paper, a well defined expenditure function in the AIDS model for food and beverages is used to calculate the CV and EV, two measures of welfare changes, for twelve different representative households in the U.S. Two government policy scenarios under investigation are the elimination of price support program for dairy industry and the imposition of sin tax on alcoholic beverages. Another measure based on the concept of price elasticity of welfare is also used as an indicator of welfare change due to price change. The results, which are useful for the policy makers, policy analysts, and consumer interests, are summarized as follows. If the dairy price support program is withdrawn by the government, the households with children, more members, higher income may receive more benefits from the decreased market prices of dairy products. Meanwhile, the black households can gain more welfare than the white household although the former has lower income. If the alcoholic beverage tax is imposed, the larger welfare loss will incur to the households who are black, middle income, or those without children , while a small gain may be attained by the married couples with children or the lowest income households.

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Endnotes

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