

## **The Taste for Variety: A Hedonic Analysis**

**Larissa Drescher<sup>+)</sup> , Silke Thiele<sup>+)</sup> , and Christoph Weiss<sup>++)</sup>**

<sup>+)</sup>  Larissa Drescher, MSc and Dr. Silke Thiele, Department of Food Economics and Consumption Studies,  
Olshausenstr. 40, D-24118 Kiel, Germany

<sup>++)</sup>  Prof. Dr. Christoph Weiss, Department of Economics, Vienna University of Economics and Business  
Administration, Augasse 2-6, A-1090, Vienna, Austria

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## 1. Introduction

‘It is obvious that our desires do not aim so much at quantity as at diversity’

(N. Senior’s ‘Law of Variety’, 1836, p. 133).

Referring to Nassau Senior’s ‘Law of Variety’, Jevons (1871) was among the first to stress the insatiability of consumers’ taste for variety in many fields of life: ‘The necessities of life are so few and simple, that a man is soon satisfied in regard to these, and desires to extend his range of enjoyment. His first object is to vary his food; but there soon arises the desire of variety and elegance in dress; and to this succeeds the desire to build, to ornament, and to furnish – tastes which, where they exist, are absolutely insatiable, and seem to increase with every improvement in civilization’ (Jevons, 1871, p.11). In the meantime, the idea of consumers’ preference for variety has come to play an important role in different areas of economics<sup>1</sup>, management theory, and marketing.

Despite the importance of product variety, very little research is available that empirically investigates consumers’ ‘taste for variety’. Most empirical studies on consumer demand focus on a particular product (or use aggregates of goods) but devote much less attention to other dimensions of consumption behavior, such as the number of different products consumed in a specific time period (product variety or product diversity). However, individuals differ in their consumption behavior in various ways. Not only does the quantity of a particular product consumed vary across individuals, the diversity of the consumption basket differs as well. The

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<sup>1</sup> The model of a representative consumer with a taste for variety (Dixit and Stiglitz, 1977) is meanwhile a standard tool in the industrial organization literature to analyze firms’ product differentiation and innovation strategies. Consumers’ ‘love for variety’ plays an important role in the theory of international trade to explain the phenomenon of intra-industry trade. Krugman (1989) surveys the early literature on the relationship between international trade and product variety. The idea that productivity is enhanced by increases in product variety is also central to endogenous growth models considered by Romer (1990) and Grossman and Helpman (1991). The early literature on the importance of product variety in economics is surveyed in Lancaster (1990). More recently, Rosen (2002) reviews the implications of diversity for markets and prices.

price a consumer pays for her consumption bundle reflects the values of the underlying attributes of goods purchased, but also accounts for any preference for variety that she might have.

This paper attempts to measure the consumers' implicit price of variety within the framework of a hedonic analysis. Based on the model of consumers' variety-seeking behavior introduced by Anderson et al. (1992), we derive a hedonic price function for a households' consumption bundle (section 2). Regressions of prices on characteristics of the consumption bundle (including a measure of diversity) for more than 3,000 households in Germany yield gradients which estimate the buyer's marginal willingness to pay for each attribute (section 3). We find that consumers have a preference for variety in food consumption, *ceteris paribus*. Section 4 provides a summary and our conclusions.

## 2. Background and model specification

An individual's taste for variety will be expressed in her consumption behavior in two ways.<sup>2</sup> The first characterization depends upon whether or not any of each available product is actually consumed. Consumers typically purchase only a small subsets of all products available and variety increases as the consumer moves from purchasing only one to purchasing all available goods. This behavior is reflected in models allowing for corner-solutions in the households' utility maximization problem. Jackson (1984) was among the first to study the demand for variety in this way.<sup>3</sup>

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<sup>2</sup> An alternative (third) approach is taken by Gronau and Hamermesh (2001). The authors do not explicitly capture a preference for variety as part of consumers' utility *per se*. Instead, they use the framework of the home-production model and incorporate a time constraint into an analysis of the demand for variety. They trace differences in demand to differences in the opportunity costs of time.

<sup>3</sup> The author characterizes a class - called hierarchic demand systems - for which only a subset of commodities is in the purchased set. Analytically, a hierarchy of purchases is introduced by focusing on the non-negativity constraints in a demand system. At low levels of income, only a small fraction of all goods available is actually consumed. At certain levels of incomes, non-necessities sequentially enter

Secondly, given the number of different products consumed, a taste for variety is related to the relative quantity of each product in the consumption basket. In the two-product case, for example, variety in consumption will be larger if the household spends 50% of total expenditure on each product, as opposed to 99% on the first and 1% on the second. According to Behrman and Deolalikar (1989) and Benassy (1996), the second characterization of a taste for variety is reflected in the curvature of the consumers' indifference curves. Within this framework, different specifications of utility functions have been used to derive a parameter that represents the 'taste for variety'. The most convenient approach for present purposes is based on the utility function suggested by Anderson et al. (1992, p. 78). The authors study the properties of discrete choice models of consumer behavior and suggest the following utility function<sup>4</sup> for a representative household:

$$U(q_1, \dots, q_J) = \begin{cases} \sum_{j=1}^J a_j q_j - \mu \sum_{j=1}^J q_j (\ln q_j / Q) + q_0 & \text{if } \sum_{j=1}^J q_j = Q \\ -\infty & \text{otherwise} \end{cases} \quad (2.1)$$

This utility function has three terms. The first captures the effect of the products' characteristic  $a_j$  on consumers' utility. Variety-seeking behavior of the representative consumer is explicitly introduced in the second term of the utility function. Ceteris paribus, the larger is  $\mu$ , the greater is the preference for variety. When  $\mu \rightarrow 0$ , variety is not valued per se and the consumer buys solely the variant with the largest net surplus,  $a_j - p_j$ . When  $\mu \rightarrow \infty$ , consumption is divided equally among all available variants. The third part captures the utility derived from an outside good  $q_0$ , which will not be considered in more detail here.

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the consumption bundle. In his empirical analysis, Jackson examines published data for 304 expenditure categories from the Consumer Expenditure Survey conducted in 1972-1973 in the USA and reports a significant and positive relationship between the number of commodities purchased and household income.

<sup>4</sup> Anderson et al. (p. 78) show that this utility function is consistent with a multinomial logit demand model, which is widely used in empirical analysis.

Using the budget constraint  $y = \sum_{j=1}^J p_j q_j + q_0$ , where the price of the outside good is normalized to 1, the Lagrangian function for the consumer's maximization problem is

$$L = \sum_{j=1}^J a_j q_j - \mu \sum_{j=1}^J q_j (\ln q_j - \ln Q) + q_0 + \lambda_1 \left( \sum_{j=1}^J q_j - Q \right) + \lambda_2 \left( y - \sum_{j=1}^J p_j q_j - q_0 \right) \quad (2.2)$$

where  $\lambda_1$  and  $\lambda_2$  are the Lagrange multipliers and  $Q$  is the aggregate quantity purchased (measured in physical units). From the first-order condition, the demand function for product  $j$  can easily be derived:<sup>5</sup>

$$p_j = a_j - \mu(\ln s_j + 1) + \lambda_1, \text{ where } s_j = q_j/Q \quad (2.3)$$

The parameter  $\mu$  can now be estimated from a system of  $J$  demand equations for a cross-section of consumers. Given that the prices of homogenous products do not vary substantially between consumers, and in order to simplify the estimation procedure, we modify this equation by multiplying by  $q_i$ . Summing over all products  $J$ :

$$\begin{aligned} \sum_{j=1}^J p_j q_j &= \sum_{j=1}^J a_j q_j - \mu \sum_{j=1}^J q_j \ln s_j - \mu \lambda_1 \sum_{j=1}^J q_j \\ &= \sum_{j=1}^J a_j q_j - \mu \sum_{j=1}^J q_j \ln s_j \frac{Q}{Q} - \mu \lambda_1 Q \\ &= A + \mu EQ - \mu \lambda_1 Q \end{aligned} \quad (2.4)$$

where  $E = -\sum_{j=1}^J \frac{q_j}{Q} \ln s_j = -\sum_{j=1}^J s_j \ln(s_j)$  is the Entropy-index of product diversity. After dividing by  $Q$ , we get

$$P = \frac{A}{Q} + \mu E - \mu \lambda_1 \quad (2.5)$$

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<sup>5</sup> Note that we assume all products to be consumed in positive quantities (i.e. no corner solutions).

where  $P$  is the unit price of the consumption bundle for each household ( $P = \frac{\sum_{j=1}^J p_j q_j}{Q}$ ). The value of the consumption bundle per unit depends on the characteristics of the products purchased (the physical attributes that are attached to the consumption bundle) as well as on the diversity of the consumption bundle. If households have a preference for variety we expect to find a significant relationship between the unit price the household pays for a bundle of products and our measure for variety. Regression analysis will be used to estimate the hedonic price function, the gradients of which are the implicit prices of the attributes.<sup>6</sup>

### 3. Data and empirical results

The present study utilizes ‘Consumer Panel Research Data’ for Germany provided by the ‘Gesellschaft für Konsumforschung’ (GfK). This data base records the expenditure behavior of households for certain product groups (e.g. food, beverages, products for washing and cleaning) as well as regional and socio-demographic characteristics such as income, region, size and composition of the household, and age of household members (for more details on the method of data collection see Prester, 2001).

This study uses a sub-sample of the 1993 panel wave with 4,392 German households. We had to remove 1,152 observations because of missing or inconsistent data. Determining an adequate time span to analyze consumption behavior can be critical (Moon, et al., 2002). In the econometric model, we use observations from the second half of 1993, results from estimation experiments on the basis of a shorter time span (quarterly observations) are available from the authors upon request. In order to simplify the measurement of product characteristics we focus on one specific product group only. The product group ‘soft drinks’

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<sup>6</sup> Hedonic price analysis has its origins in agricultural economics. Frederick Waugh (1928) published his pioneering paper on quality factors influencing vegetable prices. The classic paper on hedonic price analysis is Rosen (1974), a recent survey of this literature is available in Triplett (2004).

includes 182 non-carbonated and non-alcoholic beverages. A complete list of all soft drinks considered is available from the senior author upon request.

To calculate nutrient content information for each household, we combine households' purchased quantities of each soft drink with the German table of nutritional content, the BLS ('Bundeslebensmittelschlüssel, version II.3.1', © BfEL, 2005). This data set has information on 30 macro- and micronutrients as well as the caloric content for each soft drink. Given that consumers' knowledge of macro- and micronutrients is typically very limited (Morse and Eastwood, 1989; Brockmeier, 1993) and the correlation between individual nutrients is high (Stanley and Tschirhart, 1991), we aggregated the 30 nutrients into four categories: calories, vitamins, minerals, and trace elements.

Research on variety in food consumption has used different measures. As outlined in section 2, diversity is measured here by the entropy index. Alternative measures are used to check the robustness of our results (the results are not reported here but are available from the authors).

Results from regression models (in double log form) are summarized in Table 1.<sup>7</sup> The first column reports results from a specification which includes product attributes as well as a measure of consumption diversity. Column 2 extends this specification by adding a number of household characteristics.

Table 1

It is evident from the theoretical model of consumer behavior discussed in the previous section that households, in choosing the quantity of each product demanded, also endogenously determine the composition of the consumption basket and thus the degree of

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<sup>7</sup> Fitting a model where variables are transformed by a Box-Cox transformation yields an estimate of  $\eta = -0.47$ , which is significantly different from zero (a parameter estimate of  $\eta = 0$  would correspond to the double log formulation). Regression results from the Box-Cox model are available from the authors upon request. Although the parameter estimates are more difficult to interpret, the main results remain unchanged, however.

product diversity. Similarly, the total volume of calories (or any other product attribute) in the consumption basket of an individual household is the weighted sum of the calories per liter of the 182 different soft drinks, with the quantities consumed by the household being the relevant weights. Again, the product attributes in the regression model are endogenous. Table 1 thus reports the parameter estimates from an instrumental-variable (IV) estimation which uses household characteristics<sup>8</sup> as well as the observed consumption behavior from the first six months of 1993 as instruments.

The parameter estimates reported in Table 1 clearly show that households are willing to pay for variety. The parameter estimate of the entropy measure ( $\ln(EI)$ ) is positive and significantly different from zero. On average, a household in our sample consumes 5.4 different beverages (out of 182) and spends 1.43 DM (0.71 €) during the period analyzed (six months). The parameter estimates reported suggest that a representative household<sup>9</sup> would be willing to pay an additional 1.95% to 2.73% for a 50% increase in variety, *ceteris paribus*. This implicit price of variety does not decrease with variety; estimation results do not support a significant non-linear impact of the entropy measure.

Table 1 also reports significant effects of product characteristics on per unit household expenditures. Households are found to have a negative implicit price for calories ( $\ln(CAL)$ ) as well as vitamins ( $\ln(VIT)$ ), *ceteris paribus*. Consumers are aware of the negative consequences of excess consumption of calories and are willing to pay to avoid calories from

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<sup>8</sup> Previous empirical studies find the degree of variety in food consumption to be significantly influenced by household characteristics (see Thiele and Weiss, 2003 and the literature mentioned there).

<sup>9</sup> The reference household is a two-person household with a monthly income of 3,300 DM (1,650 €). The household is located in a city of approximately 300,000 inhabitants in West Germany. The housekeeping person is not employed and is 50 years of age. The principal wage earner has the lowest education level and is currently employed as a blue-collar worker. The reference households' soft drink bundle has a median caloric content per quantity of 0.468 calories. The soft drink bundle content of vitamins is 0.082g. The mineral and trace element content per quantity is 1.164g and 0.005g, respectively.



soft drinks.<sup>10</sup> The parameter estimate on  $\ln(CAL)$  is significantly different from zero in the first column only. The finding of a negative parameter estimate on our vitamins variable is surprising, as many soft-drink producers deliberately advertise the high vitamin content of their beverages (in particular A and E in combination with vitamin C). Cook and Eastwood (1992) also report a negative implicit price for vitamin A. Ladd and Suvannunt (1976) suggest that the negative implicit prices they found for some nutrients (among them vitamin C) may result from an undesirable taste and smell these nutrients produce.

A significant and positive implicit price is found for minerals ( $\ln(MIN)$ ), but the effect of trace elements ( $\ln(TRACE)$ ) is not significantly different from zero. The positive implicit price for minerals is consistent with previous studies (Morse and Eastwood, 1989; Cook and Eastwood, 1992).

Column 2 extends this basic specification by including a number of household characteristics in the estimating equation. In the present context, the inclusion of household characteristics is important for two reasons. As pointed out by McAlister and Pessemier (1982) variety may not only be pursued as a goal in and of itself (direct motivation) but may result from some other influence (derived motivation). Whereas economic models of consumer demand for food focus on the individual, empirical studies (including the present one) can only analyze the consumption behavior of households. If different members of a household prefer different objects, the heterogeneity of preferences within the household leads to the selection of multiple objects even if each member prefers a single good only. Differences in the size and composition of households will thus influence the degree of variety in the households'

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<sup>10</sup> Stanley and Tschirhart (1991) used sucrose and fiber in their hedonic price model and found a negative implicit price for fiber. Ranney and McNamara (2002) report a negative willingness to pay for sugar, which is an important determinant of calories. In contrast, Brockmeier, (1993) and Morse and Eastwood (1989) found positive implicit prices for calories.

consumption bundle.<sup>11</sup> Secondly, controlling for household characteristics could be one way of solving the identification problem in hedonic pricing studies. As pointed out by Nerlove (1995), ‘a large and statistically significant coefficient on a particular quality attribute in the estimated hedonic price function, may reflect not so much consumers’ high valuation of that attribute, as the influence of costs which producers incur in providing that attribute, either on its own or in relation to other attributes’ (p. 1699). The estimated coefficients in the hedonic price equation reflect both consumers’ preferences and producers’ costs. Including household characteristics allows us to identify the hedonic price function exclusively with factors reflecting consumers’ preferences.

Table 1 suggests a significant and positive impact of household income ( $\ln(INC)$ ) on expenditure per unit. A 10% increase in income raises per unit expenditure by 1%. Alternative specifications of the estimation equation (not reported here) reject the hypothesis of a non-linear impact of household income. Furthermore, consumers’ taste for variety is not significantly different between high and low income households; an interaction effect between  $\ln(EI)$  and  $\ln(INC)$  did not contribute significantly to the explanatory power of the model.

Household size and composition are significantly related to the consumption behavior observed. A large number of empirical studies have shown that an increase in family size raises the aggregate quantity of soft drinks purchased. As we can see in Table 1, this increase in volume is (partially) compensated for by a reduction in the per unit price of soft drinks consumed. Expenditure per unit decreases significantly with the number of children between

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<sup>11</sup> The authors also draw attention to a number of additional derived motives. New products are being launched continually and old ones discontinued; the brand that the household habitually purchases may be out-of-stock or a competing product may be on sale. Furthermore, observing that an individual consumes different products within a particular time period need not imply a taste for variety; this behavior is also consistent with a change in tastes within that time period. Unfortunately, these factors cannot be controlled adequately in the present empirical study.

the ages of 6 and 13 years.<sup>12</sup> Compared to the reference household (with no children), an additional child aged 5, or less, reduces food expenditure by 5.1%; an additional child between 6 and 13 years of age reduces expenditure per unit by 4.1%. The number of children between 14 and 18 years of age, as well as the number of adult household members, is not significantly related to per-unit expenditure. Neither single female households, nor single male households, were found to differ in their consumption behavior relative to the reference group (a two person household). The parameter estimates of  $SINGLE_F$  and  $SINGLE_M$ , two dummy variables, which is set equal to one in the case of a single female or single male household respectively, are not significantly different from zero at the 10% level.

The size of the city in which the household lives ( $\ln(CITY)$ ) was also found not to affect expenditure on soft drinks per quantity. The parameter estimate on  $EAST$  suggests that households living in Eastern Germany, on average, spend 11.5% less per liter than otherwise identical West German households. This result is in line with studies reporting a lower general price level for food products in Eastern Germany (Grings, 2001).

With respect to characteristics of the housekeeping person, Table 1 suggests that the taste for variety does not change with age. The parameter estimate on the ‘age of the housekeeping person’ variable,  $\ln(AGE)$ , is not significantly different from zero. In addition, no significant difference in the taste for variety can be observed for households where the housekeeping person is pursuing a full-time ( $FULL$ ), or a part-time ( $PART$ ), job in comparison to the reference household, where the household-keeping person is either not employed, or works for a few hours per week, at most.

The parameter estimates suggest a positive relationship between schooling and the taste for variety. For example, the taste for variety is 10.3% higher in a household where the principal

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<sup>12</sup> Note that we did not use the logarithm of this variable in the regression model given the large number of zero observations (households with no children in the relevant age category).

wage earner has an intermediate high school certificate ( $EDUC_3$ ) as opposed to a reference household with the lowest level of schooling. The parameter estimates of all other educational dummy variables are positive as well, although they are not significantly different from zero at the 10% level.

Finally, we find that the taste for variety also differs according to the occupation of the principal wage earner. In particular, farmers ( $FARM$ ) are found to have a significantly higher preference for variety than blue-collar workers (the reference group). The dummy variables for other occupations do not significantly influence the endogenous variables. The positive and significant parameter estimate for farmers could be due to the fact that farm households do not have to purchase all their food products on the market and, thus, do not report the full consumption basket. In particular, if low-priced beverages are produced on the farm, the average price per unit of those products purchased in the market will be higher. In addition, the significant impact of the principal wage earners' occupation may also mask regional effects. Prices for identical products may be higher for farmers located in remote areas as compared to households living in villages close to larger cities.

#### **4. Conclusions**

Based on the model of consumers' variety-seeking behavior introduced by Anderson et al. (1992), this paper derives a hedonic price function for a households' consumption bundle. The price a consumer pays for her consumption bundle reflects the values of the underlying attributes of goods purchased, but also accounts for any preference for variety that she might have. Regressions of prices on characteristics of the consumption bundle (including a measure of diversity) yield gradients which estimate the buyer's marginal willingness to pay for each attribute. The empirical analysis is conducted for 3,240 German households and their expenditure on 182 different soft drinks over a six-month period. We find that consumers

have a preference for variety in food consumption, *ceteris paribus*. The parameter estimates reported suggest that a representative household would be willing to pay an additional 1.95% to 2.73% for a 50% increase in variety, *ceteris paribus*. Consumers' marginal willingness to pay does not decrease with the degree of variety; estimation results do not support a significant non-linear impact of our measure of variety on the price of the consumption bundle.

In addition, we find that the observed per-unit price of the consumption bundle differs significantly between individuals and households. The per-unit price is significantly larger for high-income households, as well as households whose principal wage earner has a high level of education. Larger households tend to spend proportionately less on soft drinks.

However, it is important to notice the limitations of the present paper. In order to simplify the measurement of product characteristics we focus on one specific product group only, i.e. soft drinks. Theoretical models, on the other hand, frequently study hierarchic demand systems (Jackson, 1984). At low levels of income, only a small subset of all the goods available is actually consumed. At increasing levels of income, non-necessities sequentially enter the consumption bundle. This suggests a need not only to study variety within a particular group of products, but also to investigate changes in the relative importance of different product groups within the total consumption bundle of households. Whether the preference for variety between, and within, product groups is determined by the same economic, socio-demographic and regional factors, remains an open question though.

Furthermore, a preference for variety will lead consumers to switch among different products over time. This behavior cannot be fully addressed with cross-section data investigating the number of different products consumed in a particular time interval. Analyzing individual behavior over time with panel data would allow us to find out more about the 'spice of life', which is variety.

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Table 1

Results of the IV-regression of total expenditure on soft drinks per unit.

Explanatory Variables		Parameter	(t-value)	Parameter	(t-value)
Constant		0.156	(0.15)	-3.257	(-1.13)
<b>Diversity</b>					
Entropy Index	$\ln(EI)$	0.039	(2.40)	0.055	(3.37)
<b>Product Attributes</b>					
Calories	$\ln(CAL)$	-0.934	(-5.31)	0.058	(0.14)
Vitamins	$\ln(VIT)$	-0.195	(-5.15)	-0.473	(-2.54)
Minerals	$\ln(MIN)$	0.683	(7.44)	1.233	(2.39)
Trace Elements	$\ln(TRACE)$	0.206	(1.15)	-0.426	(-0.88)
<b>Household Characteristics</b>					
Household Income	$\ln(INC)$			0.100	(4.21)
# of children aged < 6	$CHILD_{<6}$			-0.051	(-3.57)
# of children aged 6 – 13	$CHILD_{6-13}$			-0.041	(-2.57)
# of children aged 14 – 18	$CHILD_{14-18}$			-0.013	(-0.44)
# of family members aged > 18	$\#FAM$			0.001	(0.07)
Single female	$SINGLE_F$			0.055	(1.40)
Single male	$SINGLE_M$			-0.016	(-0.43)
Size of the village (city)/1000	$\ln(CITY)$			0.002	(0.70)
East Germany	$EAST$			-0.115	(-2.56)
Age of housekeeping person	$\ln(AGE)$			-0.014	(-0.31)
Full time work	$FULL$			-0.009	(-0.48)
Part time work	$PART$			0.013	(0.55)
Education level 2	$EDUC_2$			0.028	(1.26)
Education level 3	$EDUC_3$			0.103	(2.32)
Education level 4	$EDUC_4$			0.065	(1.29)
Education level 5	$EDUC_5$			0.045	(1.16)
Farmer	$FARM$			0.222	(2.30)
Tradesman	$TRADE$			0.040	(0.85)
Self-employed	$SELF$			-0.084	(-1.37)
Civil servant	$CIVIL$			-0.019	(-0.65)
White-collar worker	$WHITE$			-0.023	(-0.83)
Not employed	$UNEMP$			0.001	(0.02)
$R^2$ ( $R^2_{adj.}$ )		0.109	(0.107)	0.139	(0.133)
$LL(\beta)$		-510.57		-453.578	

**Remarks:** The dependent variable is the log of unit prices of households' consumption bundles. The number of observations is 3,240.  $R^2$  (adj.) is the  $R^2$  adjusted for the degrees of freedom,  $LL(\beta)$  is the value of the log likelihood function. The t-ratios are based on heteroscedasticity consistent estimates of the covariance matrix (White, 1980).



Table A4:  
Definition and descriptive statistics of variables used

	Mean (Std.Dev.)	Minimum Maximum
Total household expenditure per unit is the total expenditure in DM on all 182 soft drinks during a six month period divided by the total volume of soft drinks measured in litres.	1.422 (0.505)	0.434 7.339
Entropy Index: $EI = \sum_{j=1}^n s_j \log(1/s_j) / 5.204$ where $s_j$ is the share of product $j$ in total food expenditure and $n$ is the number of products purchased.	0.215 (0.089)	0.007 0.494
Berry Index: $BI = 1 - \sum_{j=1}^n s_j^2$ where $s_j$ is the share of product $j$ in total food expenditure and $n$ is the number of products purchased.	0.567 (0.191)	0.138 0.898
Household caloric intake from soft drinks (gcal/1000).	0.469 (0.116)	0.046 1.876
Household intake of vitamins (A, D, E, K, B1, B2, B3a, B5, B6, B7, B9, B12, C) from soft drinks, in grams.	0.082 (0.074)	0.000 0.329
Household intake of minerals (sodium, potassium, calcium, magnesium, phosphorus, sulphur, chloride) from soft drinks, in grams.	1.164 (0.936)	0.211 11.014
Household intake of trace elements (iron, zinc, copper, manganese, fluoric, iodine) from soft drinks, in gram.	0.005 (0.002)	0.001 0.027
Household income is the net monthly income in 1,000 DM, reported in 13 income- intervals. The mean of each interval was chosen as the income for the respective household.	3.369 (1.348)	0.250 5.750
Number of children aged 5 and below	0.165 (0.459)	0 4
Number of children aged between 6 and 13	0.302 (0.628)	0 4
Number of children aged between 14 and 18	0.155 (0.404)	0 2
Number of household members aged 19 and above	2.007 (0.737)	1 6
Dummy variable which is set equal to one if the household is comprised of a single female person, otherwise zero.	0.162	0 1
Dummy variable which is set equal to one if the household is comprised of a single male person, otherwise zero.	0.029	0 1
The size of the village (city) is reported in 12 intervals according to the number of inhabitants (in 10,000). The mean of each interval was chosen as the relevant city size for the respective household.	30.015 (57.089)	0.100 200.000
Dummy variable for East-Germany is set equal to 1 if the household is living in East-Germany, otherwise zero.	0.223	0 1
The age of the household-keeping person in years is reported in 12 intervals. The mean of each interval was chosen as the relevant age for the housekeeping person.	49.087 (14.495)	10.000 72.000
Dummy variable for pursuing a full-time job. It is set equal to 1 if the household keeping person is pursuing a full-time job, otherwise zero.	0.224	0 1

Dummy variable for pursuing a half-time job. It is set equal to 1 if the household-keeping person is pursuing a half-time job, otherwise zero.	0.109	0 1
Dummy variable for lowest education level 1. It is set equal to 1 if the principal wage earner has finished 9-years of elementary school but does not have additional professional training (“Hauptschule ohne Berufsausbildung”), otherwise zero.	0.121	0 1
Dummy variable for education level 2. It is set equal to 1 if the principal wage earner has finished 9-years of elementary school or has an intermediate high school certificate and has additional professional training (“Hauptschule mit Berufsausbildung” bzw. “Mittlere Reife mit Berufsausbildung”), otherwise zero.	0.435	0 1
Dummy variable for education level 3. Is set equal to 1 if the principal wage earner has an intermediate high school certificate but does not have additional professional training (“Mittlere Reife ohne Berufsausbildung”) and is zero otherwise.	0.059	0 1
Dummy variable for education level 4. It is set equal to 1 if the principal wage earner has finished Highschool (“Abitur ohne Berufsausbildung” or “Abitur mit Berufsausbildung”), otherwise zero.	0.046	0 1
Dummy variable for education level 5. It is set equal to 1 if the principal wage earner has a degree from a technical college or a university (“Fachschule” or “Universität”), otherwise zero.	0.339	0 1
Dummy variable for the occupation of the principal wage earner. It is set equal to one if the principal wage earner is a farmer, otherwise zero.	0.003	0 1
Dummy variable for the occupation of the principal wage earner. It is set equal to one if the principal wage earner is carrying on a trade, otherwise zero.	0.017	0 1
Dummy variable for the occupation of the principal wage earner. It is set equal to one if the principal wage earner is self employed, otherwise zero.	0.013	0 1
Dummy variable for the occupation of the principal wage earner. Is set equal to one if the principal wage earner is a civil servant, otherwise zero.	0.102	0 1
Dummy variable for the occupation of the principal wage earner. It is set equal to one if the principal wage earner is a white-collar worker, otherwise zero.	0.304	0 1
Dummy variable for the occupation of the principal wage earner. It is set equal to one if the principal wage earner is a blue-collar worker, otherwise zero.	0.200	0 1
Dummy variable for the occupation of the principal wage earner. It is set equal to one if the principal wage earner is not employed (receives public assistance, is retired, unemployed, rentier, etc) , otherwise zero.	0.360	0 1

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