THE DEMAND FOR FOOD QUALITY IN RUSSIA AND ITS LINKAGE TO OBESITY

Matthias Staudigel

Justus-Liebig-University of Giessen

Matthias.Staudigel@agrar.uni-giessen.de

THE ECONOMICS OF FOOD, FOOD CHOICE AND HEALTH
1st joint eaae/aaea seminar

2010

Selected Poster Paper
prepared for presentation at the 1st Joint EAAE/AAEA Seminar

"The Economics of Food, Food Choice and Health"
Freising, Germany, September 15 – 17, 2010

The Demand for Food Quality in Russia and its Linkage to Obesity

Abstract

This study analyses whether Russian households differ in their choice of food quality when they differ in their number of overweight and obese members. Using survey data from the Russia Longitudinal Monitoring Survey (RLMS) for the years 1995-2005, households are classified into three weight groups. Quality elasticities of expenditures are estimated by a fixed-effects panel model regressing unit values of several food groups on expenditures and a set of household characteristics. Coefficients for each weight group are received by including interaction terms of expenditures and weight group dummies. A set of Wald tests is applied to test for slope heterogeneity across weight groups. Descriptive statistics reveal that obese households actually purchase larger quantities and pay less per unit for many food products. However, estimates of the quality elasticity show low absolute values and range from -0.2 to 1.1 for single food groups and the null hypothesis of equal parameters for all weight groups cannot be rejected.

Keywords: unit values; quality choice; quality elasticity; obesity; Russia; RLMS;

JEL-Classification: C23; D12; I10; I18; Q18;

1 Introduction

Economic research has linked the global rise in overweight and obesity to technical progress. Industrialised food production, ready-to-eat meals and time saving technologies at home have decreased the cost of energy intake (Cutler et al. 2003; Lakdawalla and Philipson 2009; Philipson and Posner 2003). Moreover, the relative prices of highly-processed and energy-dense foods have shown a stronger decrease than those of "healthier" foods (Gelbach et al. 2007). As a consequence, some authors suggest increasing the costs of energy dense foods and making healthier foods cheaper (e.g. Brownell et al. 2009).

However, there is a large body of literature, especially in development economics, showing that an increase in income or a relative price reduction does not necessarily influence just the quantity purchased. Subramanian and Deaton (1996) state, that "demand for energy will rise, not one for one, as consumers substitute quality for quantity." Behrman and Deolalikar (1988) report, that even in very poor regions, people show considerable demand for higher quality. Thus, when income increases or prices of food decline in general, people purchase higher-quality vegetables or cuts of meat, for example. Quantity will slowly approach a saturation level and consumers spend a larger share of rising expenditures on higher quality. Given this scenario, we could expect rather stable quantities and energy intake despite cheaper foods.

As only parts of the population seem to be affected by changing food environment and lifestyles one could ask whether households consisting of many overweight people make different choices regarding food selection than those whose members have normal weight. Given more wealth, people generally can decide whether they consume more of the same products or products with higher quality. The objective of the present paper is to test, whether this is the case and households that differ in the weight status of their members show different quality reactions when their resources change.

Using data from the Russia Longitudinal Monitoring Survey (RLMS) the present analysis examines the case of Russia where obesity and overweight are a serious health problem (Doak et al. 2000; Huffman and Rizov 2007; Jahns et al. 2003). Moreover, product variety has dramatically increased during transition and consumers set high value on quality but are also price sensitive at the same time (Schmid 2004; Honkanen and Frewer 2009). So far, two studies have been conducted about the quality choice of consumers in Russia and the linkage to household resources. Manig and Moneta (2009) estimate Engel curves for quantities and quality (of calories) and conclude that Russian households increase the quality of the foods they purchase with rising income. However, Stillman and Thomas (2008) find that a change in resources only leads to shifts between cheap and expensive food groups (like starches and meats) but there is little to no change in quality within one food group.

The present paper analyses the demand for quality of single food items (in terms of expensiveness) over population groups stratified by weight. Households are firstly classified into weight groups. Then quality elasticities of expenditures on several food groups are estimated. Finally, Wald tests are applied to test for heterogeneity in the quality elasticity across weight groups.

The paper proceeds as follows. Section 2 gives the theoretical background on the demand for quality. Section 3 introduces the data and describes the weight classification of households. Section 4 provides descriptive statistics on spending patterns of Russian households and presents the regression and tests results. In Section 5 the results are discussed and conclusions are drawn.

2 Modelling the Demand for Quality

Economic modelling of the demand for quality is based on the work of Deaton (1988; 1997). A central element in this context is the unit value which is the ratio of expenditures divided by quantities of a certain product observed for each household. Since the observed food groups are aggregates of many heterogeneous products chosen by each household, unit values contain information on the actual market prices as well as on the households' quality choice, i.e. whether households purchased more or less expensive products. The basic assumption is that if data are collected for households that belong to the same cluster (e.g. village, site) there should be no substantial variation in market prices within each cluster for the same product. Given this fixed price structure, the within cluster variation of unit values computed for each household allows to analyse the influences of income, expenditures and household characteristics on quantities and qualities of foods purchased.

Let c be a cluster of households and p_c a vector of market prices of individual goods within a product group within that cluster. Let the scalar λ_c be the general price level of this product group (e.g. a Laspeyres index) in cluster c compared to other clusters and p_c^* be a vector that describes the relative price structure between the individual goods which is constant within each cluster. Then we have the following relation:

(1) $$p_c = \lambda_c p_c^*$$

According to (1), the actual market prices p_c are a function of the price level λ_c and the relative price structure within each cluster p_c^*. A certain product group's quantity Q_c purchased by each household is determined by the vector of the quantities of all individual food items q_c:

(2) $$Q_c = k^0 \cdot q_c ,$$

where k^0 is a vector of ones. The expenditures E_c for the product group are the product of p_c times q_c, or using equation (1):

(3) $$E_c = p_c \cdot q_c = \lambda_c p_c^* q_c .$$

Dividing expenditures by quantity, we get the expression for the unit value V_c from (2) and (3):

(4) $$V_c = E_c / Q_c = \lambda_c \cdot \frac{p_c^* \cdot q_c}{k^0 \cdot q_c} = \lambda_c \left(\frac{\sum p_c^{*i} q_c^i}{\sum q_c^i} \right) = \lambda_c v_c \, .$$

In equation (4), v_c is an expensiveness or quality index that indicates the relative expensiveness of a households' food basket or the average cost of food items *i* per food group of a single household. Writing (4) in logarithms gives:

(5) $$\ln V_c = \ln \lambda_c + \ln v_c \, .$$

Equation (5) illustrates that the observed unit value is a function of the market price level within a cluster and each household's quality choice. The price level λ_c is exogenous to individual household decisions. But the quality index v_c is endogenous, because it depends on income/expenditures, prices, and household characteristics (Yu and Abler 2009). Thus, quality choice can be modelled as a function of total expenditures *X* and a vector of household characteristics *S* (Beatty 2007)[1]:

(6) $$\ln v = \alpha + \beta \ln X + \sum_j \theta_j S_j + \varepsilon \, .$$

The coefficient β in equation (6) is the quality elasticity of expenditures that shows how households change the quality level of a product group, when their resources change. Inserting (6) in (5) gives:

(7) $$\ln V = \alpha + \beta \ln X + \sum_j \theta_j S_j + \sum_c \gamma_c D_c + \varepsilon \, .$$

With observable unit values on the left hand side equation (7) can now be estimated to derive values for β. Since unit values also vary with actual market prices, the model in (7) is ideally estimated with price data on the right hand side. Consistent estimation of non-price parameters, however, is possible when we assume that market prices do not vary within each cluster. Therefore, $\sum_c \gamma_c D_c$ a set of dummies for each cluster controls for effects of λ_c (Beatty 2007).

[1] Subindexes for clusters are dropped.

Now consider a household that has reached its saturation level for a certain food group. An increase in expenditures might no longer cause an increase in quantity but in quality (i.e. the unit value), yielding higher values for β. On the contrary, if a certain household still prefers to get more quantity, it might not spend that much on quality and β would be lower. The present analysis tries to test if exactly these considerations apply to the case of households with mainly normal weight and households with mainly overweight/obese members in Russia.

3 Data

3.1 RLMS

The Russia Longitudinal Monitoring Survey (RLMS) has been implemented to measure the impact of transition and accompanying reforms on living conditions in the Russian Federation. It comprises a series of repeated cross-section surveys that collect detailed data on, for example, individual health and nutrition, expenditures, assets and sociodemographic characteristics of households as well as community level food prices and infrastructure. In order to get a nationally representative sample, the RLMS was designed as a stratified three-step cluster sample. Households were the target units, defined as a group of people "dwelling together and sharing a common budget (Zohoori et al. 1998)".[2] Additional to the (weighted) cross-sections that are nationally representative, there is a longitudinal component that allows a panel to be created that consists of those households that have been interviewed in two or more consecutive rounds. These longitudinal data show what has happened to households and individuals with given characteristics over time.

The present analysis uses household-level data from the nine Phase II rounds 6 to 14 covering the years 1995 to 2005.[3] This panel comprises a total of 8,951 responding households. Of these, 6,428 have been interviewed in at least two rounds. Observations with negative income and expenditures were excluded. Also those households that live in rural areas are excluded, as the consumption and shopping behaviour of farming households might significantly differ from non-farming households because they rely on home produced goods in their usual diet. After purging missing and implausible values the analytical sample includes 4,841 responding households and 24,225 household-year observations. About twenty-two percent of the households responded in two waves, 17% in three, 12% in four, 9% in five, 8% in six, 7% in seven, 7% in eight, and 18% in all nine waves.

[2] For more details on the design of the RLMS see e.g. Heeringa (1997); Swafford and Kosolapov (2002); Jahns et al. (2003).

[3] Altogether Phase II includes waves 5 to 17 that were conducted in the last quarter of 1994, 1995, 1996, 1998 and from 2000 to 2008, respectively. In 1997 and 1999, no surveys were conducted.

Finally, the RLMS contains post-stratification weights for unbiased (e.g. nationally representative) estimation of descriptive statistics for cross-sections. However, the present analysis does not use sample weights as it is longitudinal and includes follow-up households from the non-cross-sectional part who have sample weights zero (RLMS, 2010).[4]

3.2 Classification of Households

Expenditures, quantities purchased, and thus, unit values, are only observed at the household level. Therefore, we need to categorise households according to their members' weight status in order to test whether households that differ in the number of overweight and obese members also differ in their behaviour. Following an approach of Doak et al. (2000) the present analysis divides households into three weight categories: normal, overweight and obese. First, each adult member was categorized using the BMI cut-offs BMI<25 (normal), 25<BMI<30 (overweight) and BMI>30 (obese). For the members of age 2 to 18 the age adjusted percentile equivalents published by Cole (2000) were used for classification. In the next step households were classified as follows:

- Obese: any household with an obese member;
- Overweight: any household with an overweight person and no obese person
- Normal: neither obese nor overweight household members.

After this classification, 25% of all household-year observations show neither obese nor overweight persons. Obese and overweight household observations account for about 37% each.

Table 1 depicts transition probabilities between household weight groups for consecutive rounds. In 85.8% of all cases, a household classified as "obese" in one round will also be "obese" in the next round. The same interpretation holds true for "overweight" with 74.8% and "normal" with 76.7%. These figures indicate that the groups are relatively stable.

[4] Heeringa (1997) points out that there "…is considerable debate over the value of using weights in multivariate analysis. Some statisticians argue that using weights is not necessary if the fixed effects that explain the variation in weights are included in the model. In RLMS data, the household characteristics that explain the greatest variation in weights are the geographic region and the urban/rural character of the civil division in which the dwelling is located. Variation in individual weights will reflect the geographic effects for households as well as differentials due to post-stratification of the sample by major geographic regions, age, and sex".

Table 1: Transition Probabilities between household weight groups

		Obese	Overweight	Normal	Total
	n	6,196	851	178	7,225
Obese	%	**85.8%**	11.8%	2.5%	100.0%
	n	1,079	5,503	779	7,361
Overweight	%	14.7%	**74.8%**	10.6%	100.0%
	n	129	990	3,679	4,798
Normal	%	2.7%	20.6%	**76.7%**	100.0%
	n	7,404	7,344	4,636	19,384
Total	%	38.2%	37.9%	23.9%	100.0%

Source: RLMS, 1995-2005.

Table 2 shows correlation coefficients between the group indicators obese and overweight and the share of obese and overweight persons in the household. As the coefficient of .83 for obese is quite high, this group seems to reflect the number of obese very well. The correlation between the indicator overweight and the share of overweight people is somewhat lower but still over .70. This is possibly caused by the fact that many households in the obese group have also a high share of overweight people.

Table 2: Correlation Weight Indicators and shares of overweight and obese family members

	Obese	Overweight	Share obese	Share overweight
Share obese	**0.8256***	-0.4958*	1	
Share overweight	-0.2739*	**0.7125***	-0.3072*	1

* Significant at the 1%-level.

Source: RLMS, 1995-2005.

4 Results

4.1 Descriptive Statistics

To provide a context for the regression results in Section 4.3, this section shows a series of descriptive statistics on food consumption and spending patterns across household weight groups. Since body weight and energy intake likely are a positive function of income in Russia (Jahns et al. 2003) statistics are further stratified by income in order to compare the behaviour of weight groups at the same level.

Starting with Table 3 we get a first important result on spending patterns.[5] The first row shows that normal households have higher per-capita incomes (*PCY*) than obese households for all income levels. The average income growth from the medium to the highest tertile is

[5] All monetary values here and later are expressed in constant rubles (100 = 2005).

also considerably larger than from the lowest to the medium level. The total per-capita expenditures (*PCE*) in the second row follow the same pattern. They are higher for normal households than for obese households. At the high-income level, for example, normal households spend 7,470 rubles per capita per week compared to 6,832 rubles per capita per week for obese households. However, when we look at the total food expenditures per-capita (*PCEF*), the picture has completely changed. Obese households spend more on food than normal households in the lowest (1,406 rubles vs. 1,291 rubles), medium (1,973 rubles vs. 1,810 rubles), as well as the highest income tertile (2,628 rubles vs. 2,583 rubles). Translated into budget shares, obese households spent 53.2% of their total expenditures on food compared to 51.6% and 51.0% for overweight and normal households, respectively. These facts point to the great importance that is attached to food by households with more obese members.

Table 3: Income, total expenditures and food expenditures per capita by income tertile and weight category

	Income	Normal	Overweight	Obese
	Low	2,358	2,103	2,237
PCY	Medium	3,221	3,178	3,137
	High	6,410	7,012	6,190
	Low	2,869	2,861	2,859
PCE	Medium	3,935	3,827	3,873
	High	7,470	7,451	6,832
	Low	1,291	1,353	1,406
PCEF	Medium	1,810	1,855	1,973
	High	2,583	2,607	2,628

Source: RLMS, 1995-2005.

Budget shares of single food groups reveal further preferences of different household weight groups. Most of all, obese households devote a larger share of their budget to the group of meats (reaching 14.1% vs. 13.0% and 11.8% for overweight and normal households, respectively). Moreover, obese households have higher budget shares of potatoes (2.1% vs. 1.5% and 1.3%) and fish. Surprisingly, this is also true for vegetables whose share amounts to 2.7% for obese households and 2.1% for normal households. On the contrary, obese households show substantially lower budget shares of eating out (3.6% vs. 4.5% for normal households) as well as of alcohol (1.6% vs. 2.5% for normal households).

Table 4 depicts quantities consumed per capita and per week by household weight groups and income tertiles for selected product groups. These figures stress the differences between weight groups. Obese households consume about 1.5kg to 2.0kg more potatoes and about 0.5-

0.9kg vegetables per capita and per week than normal households. The differences in meat consumption get larger when income increases. At the low-income level obese households consume 0.1kg more than normal households per capita and per week. At the high-income level, the difference amounts to 0.3kg. On the contrary, normal households' consumption of tobacco and alcohol is considerably higher for all income levels. The differences for all other food groups do not reveal different diet patterns. Hence, obese households do not follow the stereotype of just consuming products high in fat and sugar. They do purchase more meat and potatoes, but they also consume more vegetables and bread and even less alcohol and tobacco than normal-weight households. Thus, the problem seems not to be that they tend to consume a different (less healthy) diet mix compared to normal-weight households, but that they consume larger quantities.

Table 4: Quantities per capita by weight and income tertile for selected food groups.

		Weight Category		
	Tertile	Normal	Overweight	Obese
Potatoes	Low	1.48	1.73	3.01
	Medium	1.64	2.60	3.76
	High	1.48	1.64	2.73
Vegetables	Low	1.06	1.36	1.82
	Medium	1.75	2.02	2.70
	High	1.63	1.86	2.15
Meats	Low	0.93	0.96	1.02
	Medium	1.24	1.30	1.46
	High	1.45	1.64	1.77
Alcohol	Low	0.26	0.24	0.16
	Medium	0.32	0.23	0.18
	High	0.52	0.39	0.40
Tobacco	Low	1.42	1.17	1.06
	Medium	1.46	1.04	1.12
	High	1.81	1.47	1.60

Source: RLMS, 1995-2005.

The question is now whether obese households realise higher quantities by spending considerably less per unit purchased. The figures for unit values of selected product groups in Table 6 indicate, that obese households actually buy lower quality (i.e. less expensive) goods. The most impressive differences can be observed within the meat group, where normal households spend about 103 rubles per kg and obese households only about 85 rubles/kg. Cereals, vegetables, fruits, as well as sugar & confectionery show the same pattern, although with lower magnitudes. Obese households pay also less for alcohol but more for tobacco.

This supports the hypothesis that households with one or more obese members purchase less expensive products. Only in the lowest income tertile, the differences are not very large, and some unit values are higher. This could arise from lacking possibilities to purchase even cheaper foods at this level. On the other hand, higher-income households might be able to choose from a greater variety of products with different prices.

Table 5: Unit Values by weight and income tertile for selected food groups.

		Weight Category		
	Tertile	Normal	Overweight	Obese
Cereals	Low	20.4	21.0	19.9
	Medium	21.4	21.1	20.2
	High	25.3	24.2	22.8
Vegetables	Low	16.3	14.7	13.6
	Medium	16.9	15.9	14.5
	High	22.1	20.8	20.0
Fruits	Low	32.2	30.6	30.2
	Medium	33.6	30.6	29.9
	High	40.2	39.0	35.8
Meats	Low	103.4	90.3	84.2
	Medium	103.7	92.3	86.3
	High	103.8	90.1	85.1
Sugar & Confectionery	Low	51.7	53.3	52.9
	Medium	61.8	60.5	57.0
	High	77.4	76.7	73.6
Alcohol	Low	32.8	26.4	22.6
	Medium	52.0	37.8	33.8
	High	61.0	60.0	54.9
Tobacco	Low	72.9	73.6	72.6
	Medium	75.8	82.9	82.7
	High	84.5	92.1	91.3

Source: RLMS, 1995-2005.

4.2 Estimation Strategy

The empirical analysis is based on equation (7) in Section 2. The objective is to test whether normal, overweight and obese households show a different demand for quality, i.e. whether they are heterogeneous in β and $\beta_1 \neq \beta_2 \neq \beta_3$. Thus, following Gould (2002), we rewrite:

(8) $$\ln V_{ht} = \beta_1 \ln X_{ht} + \beta_2^* (\ln X_{ht} \cdot G_2) + \beta_3^* (\ln X_{ht} \cdot G_3) + \sum_j \theta_j S_{jht} + \sum_c \gamma_c D_c + \sum_y \xi_y T_y + \varepsilon_{ht}$$

with, $\beta_2^* = \beta_2 - \beta_1$ and $\beta_3^* = \beta_3 - \beta_1$; *h* indexes households, *t* time, and *c* clusters. G_2 and G_3 are dummies for overweight and obese household groups, respectively. S_{jht} is a set of

household characteristics, namely household size, the household head's education, age, and gender, D_c is a set of cluster dummies that control for spatial price variation, T_y is as a set of year dummies that control for macro effects in the course of time.
Unobservable household characteristics like preferences or abilities or other community level factors than food prices like availability of shops, infrastructure or tradition and eating habits are likely to influence unit values. These are potential sources of bias in econometric analyses when correlated with exogenous variables that result in confounding bias when they are not explicitly controlled for. Hence, the error term becomes $\varepsilon_{ht} = e_h + u_{ht}$. Hausman tests indicated that the regressors are correlated with individual-specific error terms e_h, so fixed-effects is the appropriate model.

One concern with the model is that *X* might possibly be endogenous to *V*. Therefore, the model was additionally estimated by an instrumental-variable regression using income as instrument for *X* (Beatty 2007). However, a Hausman test showed no differences in parameter estimates for the initial and the IV regression, indicating that *X* can be treated as exogenous.

Having received coefficients for β_1, β_2^*, and β_3^*, a set of Wald tests is performed that test whether the quality elasticity is significantly different between weight groups according to the following scheme:

1) Test of $\beta_2^* = 0$, H0: $\beta_2 = \beta_1$ H1: $\beta_2 \neq \beta_1$

2) Test of $\beta_3^* = 0$, H0: $\beta_3 = \beta_1$ H1: $\beta_3 \neq \beta_1$

3) Test of $\beta_3^* = \beta_2^*$, H0: $\beta_3 = \beta_2$ H1: $\beta_3 \neq \beta_2$

4.3 Regression Results

Model (1) in Table 6 presents the coefficients of *ln X* from the regressions for several product groups and additionally for the unit value of energy computed as per-capita food expenditures divided by energy intake per capita. These regressions were performed over the full sample without dummies and serve as a basis for the further analysis. The results confirm the findings by Manig and Moneta (2009) and Stillman and Thomas (2008). Russian consumers react to resource changes by shifting consumption between rather than within product groups. When total per-capita expenditures increase by 10%, the per-unit cost of energy increases by 6%. Most of the coefficients for single product groups are highly significant, but their values range

Table 6: Fixed-effects regression estimates of the quality elasticity of expenditures for several product groups.

	Model (1)			Model (2) including group dummies							
	$\delta \ln V / \delta \ln X$			$\delta \ln V / \delta \ln X$			$\delta \ln V / \delta \ln X \cdot G_2$		$\delta \ln V / \delta \ln X \cdot G_3$		
Energy	0.620	(0.0111)	***	0.618	(0.0113)	***	0.002	(0.0018)	0.003	(0.0022)	
Meat	0.031	(0.0045)	***	0.030	(0.0047)	***	0.000	(0.0009)	0.001	(0.0012)	
Bread	0.008	(0.0035)	**	0.008	(0.0035)	**	0.000	(0.0009)	0.000	(0.0011)	
Cereals	-0.017	(0.0067)	**	-0.016	(0.0068)	**	0.000	(0.0014)	-0.002	(0.0018)	
Potatoes	0.009	(0.0104)		0.011	(0.0108)		-0.001	(0.0023)	-0.003	(0.0029)	
Vegetables	0.061	(0.0116)	***	0.063	(0.0119)	***	-0.003	(0.0029)	-0.001	(0.0035)	
Fruits	0.034	(0.0129)	***	0.036	(0.0132)	***	-0.003	(0.0027)	-0.002	(0.0034)	
Milk	0.046	(0.0070)	***	0.046	(0.0071)	***	0.001	(0.0015)	0.000	(0.0018)	
Dairy	0.043	(0.0086)	***	0.040	(0.0088)	***	0.002	(0.0019)	0.004	(0.0023)	
Vegetable fats	0.010	(0.0057)	*	0.012	(0.0058)	*	-0.002	(0.0013)	-0.003	(0.0016)	*
Sugar & Confectionery	0.102	(0.0105)	***	0.101	(0.0107)	***	-0.001	(0.0021)	0.003	(0.0027)	
Fish	0.112	(0.0236)	***	0.113	(0.0240)	***	-0.002	(0.0051)	-0.001	(0.0062)	
Coffee & Tea	0.100	(0.0152)	***	0.098	(0.0153)	***	0.004	(0.0032)	0.001	(0.0041)	
Beverages	0.017	(0.0188)		0.022	(0.0192)		-0.002	(0.0040)	-0.008	(0.0053)	
Alcohol	0.091	(0.0196)	***	0.094	(0.0199)	***	-0.001	(0.0041)	-0.005	(0.0051)	
Tobacco	0.087	(0.0092)	***	0.088	(0.0093)	***	-0.001	(0.0021)	0.000	(0.0027)	

* Significant at the 10% level.
** Significant at the 5% level.
*** Significant at the 1% level.
Note: Heteroscedasticity-robust Huber/White standard errors are reported in parentheses. All regressions control for household size, the household head's education, age, and gender as well as year fixed effects.

from -.02 for cereals to .11 for fish. Hence, the quality elasticity of expenditures is rather low. For example, a 10% increase in total expenditure would increase the average quality purchased expressed in unit values by 0.3% for meat, 0.6% for vegetables, 0.5% for milk, and 1.1% for fish. These magnitudes are in line with results from Stillman and Thomas (2008) for the same dataset who report values from -0.05 for meat to 0.15 for all fruits and vegetables. However, they used per-capita expenditures as variable and performed the analysis over individuals rather than households.

Model (2) in Table 6 presents these regression coefficients again but now includes interactions of *ln X* with dummies for overweight and obese households. The signs of these interaction terms do not show a clearly negative or positive tendency and their absolute values range from 0.01 - 0.001. This already indicates that the quality reactions do not differ considerably across weight groups. The related Wald tests for slope heterogeneity in Table B (Appendix) substantiates that there is no significant difference. Only vegetable fats and sugar & confectionery show significant tests, but still the differences are rather small. Thus, the present analysis does not provide any evidence for a different demand for quality of households with more overweight or obese people.

Table 7: Wald tests for slope heterogeneity across weight groups.

	Hypotheses					
	$\beta_2 = \beta_1$		$\beta_3 = \beta_1$		$\beta_3 = \beta_2$	
Energy	0.99	(0.320)	1.49	(0.223)	0.31	(0.576)
Meat	0.04	(0.848)	0.20	(0.656)	0.17	(0.679)
Bread	0.22	(0.641)	0.06	(0.801)	0.74	(0.390)
Cereals	0.05	(0.823)	1.33	(0.249)	1.76	(0.184)
Potatoes	0.27	(0.601)	0.99	(0.321)	0.66	(0.417)
Vegetables	0.73	(0.392)	0.10	(0.748)	0.41	(0.522)
Fruits	0.94	(0.333)	0.36	(0.550)	0.05	(0.817)
Milk	0.45	(0.504)	0.07	(0.789)	1.30	(0.255)
Dairy	1.44	(0.231)	2.66	(0.103)	0.92	(0.337)
Vegetable fats	1.48	(0.224)	3.00	(0.084)*	1.46	(0.228)
Sugar & Confectionery	0.26	(0.611)	1.38	(0.240)	4.71	(0.030)**
Fish	0.13	(0.724)	0.03	(0.873)	0.04	(0.840)
Coffee & Tea	1.67	(0.196)	0.03	(0.871)	1.26	(0.261)
Beverages	0.30	(0.583)	2.22	(0.137)	2.06	(0.151)
Alcohol	0.07	(0.790)	0.86	(0.353)	0.89	(0.345)
Tobacco	0.49	(0.484)	0.02	(0.886)	0.29	(0.589)

Note: F-statistics are reported and p-values are reported in parentheses.

To assess whether there are larger differences at a certain income level, additional regressions were conducted stratified by income, but again, no significant differences could be found.

Another reason that weight groups were found to react rather similar could be, that they have not been divided sharply enough. Therefore, a further regression includes only those households that stay in one weight group over all nine rounds. This should ensure that there is actually a clear cut classification. However, also here the tests for heterogeneous parameters were insignificant.

5 Discussion and Conclusion

The present analysis sought to identify whether households that differ in the number of overweight/obese members also differ in their choice of food quality. This investigation was based on a theoretical model by Deaton (1988; 1997) that identifies the demand for quality by assessing the impact of expenditures on unit values. Using data from the Russia Longitudinal Monitoring Survey, households were classified into normal, overweight and obese and different spending patterns were described. Fixed-effects hedonic regressions on unit values for several food groups were performed that included interaction terms for expenditures and weight categories. A series of Wald tests was then applied to test for differences in the quality elasticities of expenditure across weight groups.

Descriptive statistics revealed that obese households actually spend more on foods, consume larger quantities and show lower per-unit costs for the majority of food groups. Especially meat showed considerable differences in quantities and unit values, indicating that obese households might trade off quality for quantity.

However, the estimates of the hedonic regressions do not support this view. Quality elasticities ranging from -0.2 to 1.1 for single food groups indicate that the quality reaction due to resource changes is low within food groups. For the unit value of energy the coefficient is considerably higher, with about 0.62. These results are in line with previous work from Stillman and Thomas (2008) as well as from Manig and Moneta (2009): Russian households shift between but not within food groups, when their income/expenditures change. Finally, the Wald tests on slope heterogeneity detected no significant differences in quality elasticities across household weight groups. Thus, normal and obese households do not differ significantly in their demand for quality.

What are possible reasons for these results? Firstly, the present analysis only examines the changes in quality when expenditures change. Given the fact that obese households spend more on food but less in total, we might conclude that they do not actually have to decide whether to buy more quality or to purchase more quantity. They could increase their quality by the same amount as normal households do but at the same time increase their quantity even more. Moreover, as descriptive statistics reveal, there already seems to be an initial difference in unit values. Hence, rather than comparing expenditure effects on quality across weight groups a direct assessment of the linkage between unit values and obesity/body weight would be more insightful. However, such a relation would be simultaneously determined and the analysis would suffer from possible endogeneity problems.

6 References

Beatty, T.K.M., 2007. The Scope of the Unit Value Problem. In: Consumer and Market Demand Agricultural Policy Research Network, Project Report Number CMD-07-06. Department of Rural Economy, University of Alberta, Edmonton, Canada.

Behrman, J.R., Deolalikar, A.B., 1987. Will Developing Country Nutrition Improve with Income? A Case Study for Rural South India. Journal of Political Economy, 95(5), 492-507.

Brownell, K.D., Farley, T., Willett, W.C., Popkin, B.M., Chaloupka, F.J., Thompson, J.W., Ludwig, D.S., 2009. The public health and economic benefits of taxing sugar-sweetened beverages. New England Journal of Medicine, 361, 1599-1605.

Cole, T. J, Bellizzi, M.C., Flegal K.M., Dietz, W. H., 2000. Establishing a standard definition for child overweight and obesity worldwide: international survey. British Medical Journal 320, 1240-1243.

Deaton, A., 1988. Quality, Quantity, and Spatial Variation of Price. American Economic Review 78(3), 418-430.

Deaton, A.,1997. The Analysis of Household Surveys. A Microeconometric Approach to Development Policy. The World Bank: Washington, D.C.

Doak, C.M., Adair, L.S., Monteiro, C., Popkin, B.M., 2000. Overweight and underweight coexist within households in Brazil, China and Russia. Journal of Nutrition 130, 2965-2971.

Gelbach, J.B., Klick, J., Stratman, T., 2007. Cheap Donuts and Expensive Broccoli: The Effect of Relative Prices on Obesity. Florida State University, College of Law, Public Law Research Paper No. 261.

Gould, W. (2002), Chow tests. STATA FAQs. Available online: http://www.stata.com/support/faqs/stat/chow3.html. Access: August 17, 2010.

Heeringa, S.G., 1997. Russia Longitudinal Monitoring Survey (RLMS). Sample Attrition, Replenishment, and Weighting in Rounds V-VII, available at http://www.cpc.unc.edu/projects/rlms/project/samprep.pdf. Access: July 15, 2008.

Honkanen, P., Frewer, L., 2009. Russian Consumers' motives for food choice. Appetite 52, 363-371.

Huffman, S.K., Rizov, M., 2007. Determinants of Obesity in Transition Economies: The Case of Russia. Economics and Human Biology 5, 379-391.

Jahns, L., Baturin, A., Popkin, B.M., 2003. Obesity, diet, and poverty: trends in the Russian transition to market economy. European Journal of Clinical Nutrition 57, 1295-1302.

Lakdawalla, D., Philipson, T.J., 2009. The Growth of Obesity and Technological Change. Economics and Human Biology 7, 283-293.

Manig, M., Moneta, A., 2009. More or better? Measuring Quality versus Quantity in Food Consumption. Working Paper 2009/17, Laboratory of Economics and Management, Sant'Anna School of Advanced Studies.

Philipson, T.J., Posner, R.A., 2003. The Long-Run Growth in Obesity as a Function of Technological Change. Perspectives in Biology and Medicine 46, 87-107.
RLMS (Russia Longitudinal Monitoring Survey), 2010. Sampling Overview, available at http://www.cpc.unc.edu/projects/rlms/project/sampling.html. Access: May 19, 2010.
Schmid, S., 2004. Der russische Konsument. Lebenswelt, Konsumverhalten, Markenwahrnehmung. Münster et al.: OWC – Verlag für Außenwirtschaft.
Swafford, M.S., Kosolapov, M.S., 2002. Sample Design, Response Rates, and Weights in the Russia Longitudinal Monitoring Survey, Rounds 5 to 10: An Abbreviated Description.
Stillman, S., Thomas, D., 2008. Nutritional status during an economic crisis: Evidence from Russia. The Economic Journal 118, 1385-1417.
Subramanian, S. and A. Deaton (1996): The Demand for Food and Calories. Journal of Political Economy 104(1), 133-162.
Yu, X., Abler, D., 2009. The Demand for Food Quality in Rural China. American Journal of Agricultural Economics 91(1), 57-69
Zohoori, N., Mroz, T.A., Popkin, B.M., Glinskaya, E., Lokshin, M., Mancini, D., Kozyreva, P., Kosolapov, M., Swafford, M., 1998. Monitoring the Economic Transition in the Russian federation and its Implications for the Demographic Crisis – the Russian Longitudinal Monitoring Survey. World Development 26, 1977-1993.