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# **How do obese people afford to be obese? Consumption strategies of Russian households**

**MATTHIAS STAUDIGEL**

Institute of Agricultural Policy and Market Research, University of Giessen, Germany  
Matthias.Staudigel@agrar.uni-giessen.de



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# How do obese people afford to be obese? Consumption strategies of Russian households

## 1 Introduction

Economic prosperity has substantially contributed to the global rise in obesity rates. Decreasing real food prices (Lakdawalla and Philipson, 2009; Philipson and Posner, 2003), lower costs of food preparation and higher costs of energy expenditure due to technological innovations (Cutler et al., 2003) have been blamed for the imbalance of energy intake and energy expenditure that lead to the upward shift of body weight. Some authors argue for policy options that use exactly these economic forces to halt and reverse the extension of waistlines (see e.g. Brownell et al., 2009). Much discussion has centred on fat taxes and thin subsidies. Proponents expect these instruments to create a healthier eating behaviour by increasing the price of “unhealthy” food items and reducing the price of “healthy” products. Additionally, tax revenues could be used to information campaigns on healthier lifestyles (Kuchler et al., 2005). In contrast, critics counter that a point-of-purchase tax lacks an efficient targeting and probably causes undesirable distributional effects (see Cash and Lacanilao, 2007, for an overview). Or as Smed et al. (2007) put it: “In principle, the introduction of economic regulation would result in the same changes in conditions for all consumers, and thus does not provide the possibility of targeting specific consumer segments [...]”.

Suppose, however, that the responsiveness to economic changes varies across different consumer groups. Then, knowing the direction and the magnitude of such deviations might allow policies to address specific target populations. Recently, a number of studies investigated the effects of fat taxes across consumer segments. The majority of them divided consumers into income groups and found that quantity and/or expenditure reactions vary along socio-economic lines in France (Allais et al., 2010), the United States (Chouinard et al., 2007; Cash et al., 2005; Powell, 2009; Powell and Bao, 2009), Sweden (Norström and Thunström, 2010), and Denmark (Smed et al., 2007). Other studies point out that the degree to which people react to price changes depends on the quantity they currently purchase. For example, Gustavsen and Rickertsen (2009) found the highest absolute effect of an increase in the Value Added Tax on Sugar-Sweetened Carbonated Soft Drinks among high-purchasing households. However, though segmentation on the basis of income or purchased quantities allows statements on the behaviour of consumer groups with higher or lower prevalence of overweight and obesity, an explicit distinction between obese and normal-weight consumers would yield even more and deeper insights into the interdependencies of economics and obesity. Detailed knowledge on whether obese react more or less strongly to price changes compared to those of normal weight could enhance the debate on taxes. Additionally, evidence of different reactions concerning food expenditures and food quality could point out new potential courses of action.

The objective of the present study is to examine whether obese households shift their consumption in a different way than normal-weight households. To the best of our knowledge, no-one has analysed yet the shifts in purchases caused by economic changes segmented by weight groups. We do not investigate explicit price responses but rather look at strategies to cope with fluctuations in economic resources and their effects on food expenditures, quantities and quality purchased.

We analyse the case of Russia which brings along two main advantages: first, the economic situation in Russia was characterised by strong fluctuations in the early years of transition and during the ruble crisis in 1998 (Sedik et al., 2003). This provides a natural basis to investigate the reaction of consumption strategies due to variation in economic resources which has been used by a number of studies. Sedik et al. (2003) as well as Ulijaszek and Koziel (2007) report that the availability of food energy remained nearly constant in the course of transition. For example, Russian households shifted their diet from animal products to starches or increased the preparation of foods at home (Jahns et al., 2003; Mroz and Popkin, 1995). Stillman and Thomas (2008) found, that it is mainly the longer-term resources of households that are crucial for the nutritional status measured in BMI or energy intake. Second, the Russia Longitudinal Monitoring Survey (RLMS) provides a unique combination of economic data as well as measures of anthropometry and health status that allows an analysis of economic reactions separated by weight groups. Previous work on the effects of changing economic resources on consumption patterns using the RLMS was conducted by Stillman and Thomas (2008) and Manig and Moneta (2009). They found that shifts in consumption occurred rather between food groups with different per-calorie costs than between single products within food groups. This provides an excellent basis to investigate consumption patterns for consumers of different body weight.

The article is organised as follows. In Section 2, we provide the theoretical framework and discuss possible strategies of food consumption for households of different weight status. We introduce the data and describe the weight classification of households according to weight status in Section 3. Regression and statistical test results are presented in Section 4. Conclusions and implications of the findings are elaborated in the final Section 5.

## 2 Theoretical Background

In this section, we argue that obese consumers can deviate from normal-weight consumers in their consumption strategy at three main points. They can spend a different share of their disposable income on food, purchase different quantities of food products and buy products of different quality. To illustrate this point, assume a household that decides how to divide its total budget  $Y$  between food and non-food. The total food expenditures  $X_F$  can be further allocated to expenditures for single product groups  $X_G$  such as meat, bread, fruits or vegetables:

$$(1) \quad X_F = \sum X_G$$

Expenditures on each food group  $X_G$  are the product of the quantity  $Q_G$  that is purchased and the average price per unit  $V_G$  that is paid by the household (Eq. 2). These so called unit values reflect the quality choice of the household since the products within one group are not homogeneous (Deaton, 1988).

$$(2) \quad X_G = Q_G \cdot V_G$$

Likewise, total food expenditures can be decomposed into total energy intake  $C$  (measured in calories) and the average cost of one calorie  $V_C$ :

$$(2') \quad X_F = C \cdot V_C$$

To analyse the reaction of households' food consumption on income changes we follow Behrman and Deolalikar (1987) and Manig and Moneta (2009) and take the total differential of (2):

$$(3) \quad dX_G = dQ_G \cdot V_G + dV_G \cdot Q_G$$

$$\text{or} \quad \frac{dX_G}{X_G} = \frac{dQ_G \cdot V_G}{Q_G \cdot V_G} + \frac{dV_G \cdot Q_G}{Q_G \cdot V_G},$$

$$\text{or} \quad \frac{\frac{dX_G}{X_G}}{\frac{dY}{Y}} = \frac{\frac{dQ_G}{Q_G}}{\frac{dY}{Y}} + \frac{\frac{dV_G}{V_G}}{\frac{dY}{Y}}$$

or written as elasticities:

$$(4) \quad \varepsilon_{XY} = \varepsilon_{QY} + \varepsilon_{VY}.$$

In equation (4) the total expenditure elasticity of expenditures on group  $G$ ,  $\varepsilon_{XY}$ , is expressed as the sum of the total expenditure elasticity of quantity of group  $G$ ,  $\varepsilon_{QY}$ , and the expenditure elasticity of quality of group  $G$ ,  $\varepsilon_{VY}$ .<sup>1</sup> Hence, to describe how food consumption reacts to a change in total expenditures, it is necessary to look at three aspects: a) How strong is the effect on total food expenditures and on expenditures for single food groups? b) How large is the shift in quantities of each food group? c) How strong is the effect on quality, i.e. the per-unit expenditures? The relative size of the elasticities of quantity and quality gives information on the intention of consumers. Large quantity effects would indicate that additional “physical needs” (i.e. provision of energy or satiation) are satisfied by higher incomes. In the case of large quality effects, consumers would serve “residual needs” (i.e. variety seeking, healthier diet, status value, taste, appearance, odour) (Manig and Moneta 2009).

The central question of this analysis is now whether we can expect different reactions of obese and normal-weight consumers for any of these parameters. Regarding *total food expenditures*, a rise in total expenditures may cause obese households, when they attach more importance to food, to spend a larger part of the additional money on food. In the case of declining wealth, however, obese could show a smaller reaction when they give up other things than food first. These considerations should also include the initial level of food expenditures which are likely to be higher for obese in the beginning and are then reduced to a greater extent in times of decreasing resources, because all other expenditures are indispensable for life (such as rent, medicine, etc.). For *total calories* the effect is not clear *a priori* as the levels might be different from the beginning. The same holds for *quantities of each food group* and the respective *expenditures*. The *quality elasticity* of obese consumers might be more flexible than those of normal weight. In times of hardship obese consumers might show a larger decrease of their per-unit expenditures for food as well as for single food groups in order to maintain adequate quantities for repletion.

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<sup>1</sup> However, in empirical estimation, the presence of error terms will hinder exact adding up (Manig and Moneta, 2009).

Whether or not obese households react differently with respect to their quantity and quality decisions has important implications for policies aiming to change consumption of healthy/unhealthy food products by fiscal measures. If they were more flexible in their quality decisions, obese households will simply reduce their spending on the extras but will not significantly change the quantity of foods and, thus, the calories they consume. To investigate possible differences between normal and obese households in their consumption behaviour we estimate the elasticities for group expenditures, quantity and quality as depicted in (4) separately for each household weight type. Further, the panel structure of the data allows us to account for household fixed-effects that are likely to influence consumption decisions, as e.g. shown by Behrman and Deolalikar (1987). The classification of households is described in detail in Section 3.2 and the estimation strategy is presented in Section 4.1.

### 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)”.<sup>2</sup> Additional to the (weighted) cross-sections that are nationally representative, there is a longitudinal component that allows us to create a panel 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.<sup>3</sup> 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 households located 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. Finally, the RLMS contains post-stratification weights for unbiased (e.g. nationally representative) estimation of descriptive statistics for cross-sections. In the present analysis we use sample weights only for descriptive statistics and not for the econometric analysis. The latter is longitudinal and includes follow-up households from the non-cross-sectional part who have sample weights zero (RLMS, 2011).<sup>4</sup>

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

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

<sup>4</sup> 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

Real per-capita household expenditures are used to proxy economic resources.<sup>5</sup> Stillman and Thomas (2008) interpret per-capita expenditures on non-durables as “indicative of resource availability within the household” in Russia and also Manig and Moneta (2009) argue that income data in the RLMS are probably less informative due to wage arrears and delayed wage payment as well as misreporting. Hence, per-capita expenditures are a more reliable measure for the actual purchasing power of Russian households. Food expenditures and quantities are reported by households for the last 7 days before the interview. 58 single food items were then aggregated to 15 food groups. Unit values were derived for each food group by dividing expenditures through quantity. Data on energy intake stem from 24h recalls of each participant’s consumption and are less vulnerable to wastage and intra-household allocation bias compared to calculation from purchases.

### 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. The present analysis follows a modification of the approach by Doak et al. (2000) and divides households into three weight categories: normal, overweight and obese. First, each adult member was classified using the BMI cut-offs  $BMI < 25$  (normal),  $25 \leq BMI < 30$  (overweight) and  $BMI \geq 30$  (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 at least one obese member and a share of obese and overweight persons of 50% and higher;
- Overweight: any household that does not fulfil the requirements for the obese group with at least one overweight and/or obese person;
- Normal: neither obese nor overweight household members.

Characteristics of these household categories point to a successful and adequate classification: 30% (N=7.308) of all household observations are classified as “obese” and almost 46% (N=10.997) as “overweight”. Only 24% (N=5.781) of all household-year observations show neither obese nor overweight members. The mean BMI is higher for the obese (29.4) than for the overweight (25.5) and the normal group (22.1). Obese households have on average 1.24 obese, 0.65 overweight, and 0.66 normal-weight members. This is clearly different from households classified as overweight (0.17 obese, 1.13 overweight, and 1.52 normal) and normal (2.13 normal members, as by definition: no obese and overweight members). Households in the overweight group are the largest with 3 members on average followed by the obese (2.6 members) and the normal households (2.4 members). The share of females is slightly higher in obese households. Furthermore, the weight groups are stable over time: in 85.8% of all cases, a household classified as “obese” in one round will also be “obese” in the next round. The transition probabilities for “overweight” and “normal” households are, respectively, 74.8% and 76.7%.

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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”.

<sup>5</sup> All monetary values were deflated using the monthly consumer price index for food (2005=100) in the Russian Federation that is provided by Goskomstat and is available on the statistics database of the OECD (2010).

## 4 Empirical Analysis

### 4.1 Estimation Strategy

Our approach for the estimation of Engel curves especially for unit values, but also for food expenditures and food quantities, follows Deaton (1997) and (Yu and Abler, 2009). and is expressed for the example of unit values in equation (5):

$$(5) \quad \ln V_{ght} = \beta \ln X_{ht} + \sum_j \theta_j S_{jht} + \gamma P_{ct} + \varepsilon_{ght},$$

where  $g$  indexes product group,  $h$  households,  $t$  time, and  $c$  communities. The natural logarithm of  $V_{ght}$  is regressed on the log of total household expenditures  $\ln X_{ht}$ , so that the coefficient  $\beta$  represents the total expenditure elasticity of quality. The log-linear functional form can be seen as first-order Taylor approximation to the unknown relationship (Yu and Abler, 2009). This relationship is estimated conditional on a set of household characteristics  $S_{jht}$ , namely household size, the household head's education, age, and gender, and a vector of 20 community food prices  $P_{ct}$  that controls for effects of price variation over time. The regressions for food group expenditures  $\ln X_{ght}$  and quantities  $\ln Q_{ght}$  use the same specification on the right hand side.

Other household or community characteristics that are not explicitly controlled for are likely to affect expenditures, quantities or unit values. These comprise mostly unobserved or unobservable items like preferences, abilities, availability of shops, infrastructure or tradition and eating habits and will cause confounding bias when correlated with exogenous variables. Hence, the error term becomes  $\varepsilon_{ght} = e_{gh} + u_{ght}$ . Hausman tests indicate that the regressors are correlated with individual-specific error terms  $e_{gh}$ , so fixed-effects is the appropriate model. One concern with the model is that total expenditures  $X$  might possibly be endogenous to unit values or food group expenditures. Therefore, the model was additionally estimated by an instrumental-variable (IV) regression using income as instrument for  $X$  (Beatty 2007). Hausman tests showed no differences in parameter estimates for the initial and the IV regression, indicating that  $X$  can be treated as exogenous.

To test whether normal, overweight and obese households respond differently to changes in total expenditures, i.e. whether they are heterogeneous in  $\beta$  and  $\beta_1 \neq \beta_2 \neq \beta_3$ <sup>6</sup>, we rewrite equation (5), following Gould (2002), and introduce two dummy variables  $G_2$  and  $G_3$  for overweight and obese household groups, respectively:

$$(6) \quad \ln V_{ght} = \beta_1 \ln X_{ht} + \beta_2^* (\ln X_{ht} \cdot G_2) + \beta_3^* (\ln X_{ht} \cdot G_3) + \sum_j \theta_j S_{jht} + \gamma P_{ct} + \varepsilon_{ght}$$

In equation (6), we have  $\beta_2^* = \beta_2 - \beta_1$  and  $\beta_3^* = \beta_3 - \beta_1$ , so that testing for  $\beta_2^* = 0$  and  $\beta_3^* = 0$  indicates whether parameters differ significantly.

### 4.2 Regression Results

Table 1 shows the total expenditure elasticities of group expenditures for 15 food groups as well as for total food expenditure. The first column presents the elasticity for normal-weight households; the second and the third column report the absolute deviations to the elasticities

<sup>6</sup> Here,  $\beta_1$  is the elasticity for normal,  $\beta_2$  for overweight, and  $\beta_3$  for obese households, respectively.



of overweight and obese households, respectively. All elasticities are positive and smaller than unity, hence, Engels Law proves true for Russia in each of the weight groups. When total expenditures increase by 1%, total food expenditures increase by 0.69%. The elasticities for single groups are slightly smaller. Among the product groups, bread, milk, and vegetable fats show the smallest elasticities with 0.09, 0.17, and 0.19, respectively, the highest values were found for meat (0.52), sugar and confectionery (0.49), and potatoes (0.45). This indicates that the former constitute the basis on which the provision with energy is built and the latter represent product groups that provide additional benefits besides pure calorie supply. The high elasticity of potatoes, however, is quite surprising. We could possibly explain the volatility by the fact that people buy large amounts of potatoes at certain time and then store them at home. Hence, when their money is scarce, households will not buy large amounts in advance.

**Table 1: Fixed-effects regression estimates of the total per-capita expenditures elasticity of food group expenditures per capita**

	$\beta_1$			$\beta_2^* = \beta_2 - \beta_1$		$\beta_3^* = \beta_3 - \beta_1$		$R^2$	$\beta_3^* = 0$		
<i>Total</i>	0.688	(0.0108)	***	0.003	(0.0016)	0.005	(0.0020)	**	0.46	**	
<i>Meat</i>	0.516	(0.0135)	***	0.002	(0.0024)	0.003	(0.0030)		0.20		
<i>Bread</i>	0.093	(0.0073)	***	-0.001	(0.0017)	-0.001	(0.0022)		0.15		
<i>Cereals</i>	0.259	(0.0150)	***	0.000	(0.0030)	0.001	(0.0039)		0.13		
<i>Potatoes</i>	0.450	(0.0379)	***	0.018	(0.0067)	***	0.028	(0.0086)	***	0.13	***
<i>Vegetables</i>	0.408	(0.0225)	***	0.002	(0.0046)		0.004	(0.0058)		0.11	
<i>Fruits</i>	0.347	(0.0172)	***	0.004	(0.0032)		0.006	(0.0044)		0.13	
<i>Milk</i>	0.173	(0.0110)	***	0.005	(0.0025)	**	0.005	(0.0032)	*	0.08	*
<i>Dairy</i>	0.385	(0.0130)	***	0.001	(0.0025)		0.004	(0.0033)		0.13	
<i>Vegetable Fats</i>	0.194	(0.0131)	***	-0.001	(0.0028)		-0.002	(0.0036)		0.21	
<i>Sugar &amp; Confectionery</i>	0.493	(0.0161)	***	0.004	(0.0032)		0.003	(0.0042)		0.13	
<i>Fish</i>	0.360	(0.0337)	***	0.001	(0.0066)		0.001	(0.0082)		0.09	
<i>Coffee &amp; Tea</i>	0.271	(0.0168)	***	0.007	(0.0035)	**	-0.003	(0.0046)		0.12	
<i>Beverages</i>	0.264	(0.0242)	***	-0.005	(0.0049)		-0.007	(0.0066)		0.13	
<i>Alcohol</i>	0.344	(0.0275)	***	-0.001	(0.0049)		-0.003	(0.0063)		0.12	
<i>Tobacco</i>	0.243	(0.0143)	***	-0.002	(0.0031)		0.003	(0.0041)		0.12	

\* 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 a set of community food prices.

The last column presents the results of Wald tests on parameter homogeneity between normal and obese households. We can reject the hypothesis of equal elasticities on the basis of the test results for expenditures on food in total, potatoes, and milk. However, the differences for total food and milk expenditures are very small. Only the elasticity of potatoes is about 6% higher for the obese group than for normal-weight households.

The expenditure elasticities of quantity in Table 2 indicate that large parts of the changes in food group expenditures are generated by changes in quantities within the single groups. The elasticities are in the range of zero to unity and mark food products in Russia as necessities. No inferior or luxury goods were identified. The elasticity of total energy intake is very small with about 0.07. This result supports the finding of Stillman and Thomas (2008) that Russian households shifted their consumption towards foods/food groups that provided energy at lower costs per calorie and time kept their energy intake stable at the same. Furthermore, obese and normal-weight households are equally insensitive to expenditure changes regarding their calorie intake. However, since obese might start from a higher level they are likely to

shift more in absolute terms. Again, we find obese households to react significantly more elastically in the groups of potatoes and milk with elasticities, respectively, about 6% and 7%<sup>7</sup> higher than those of normal households. The development of potato and milk quantities is illustrated in Figure 1 in the Appendix. Particularly potatoes showed substantial differences between weight groups in 1995 and 1996 when the severe economic burden of early recession years was removed. These differences collapsed in the crisis of 1998 just to rise again afterwards.

**Table 2: Fixed-effects regression estimates of the total per-capita expenditures elasticity of quantity for several product groups**

	$\beta_1$		$\beta_2^* = \beta_2 - \beta_1$		$\beta_3^* = \beta_3 - \beta_1$		$R^2$	$\beta_3^* = 0$
<i>Energy</i>	0.073 (0.0046)	***	0.002 (0.0010)		0.002 (0.0013)		0.05	
<i>Meat</i>	0.481 (0.0137)	***	0.001 (0.0024)		0.002 (0.0031)		0.16	
<i>Bread</i>	0.081 (0.0072)	***	0.000 (0.0017)		0.000 (0.0021)		0.06	
<i>Cereals</i>	0.287 (0.0171)	***	0.000 (0.0035)		0.005 (0.0044)		0.08	
<i>Potatoes</i>	0.433 (0.0397)	***	0.018 (0.0069)	***	0.027 (0.0089)	***	0.12	***
<i>Vegetables</i>	0.342 (0.0244)	***	0.003 (0.0053)		0.003 (0.0067)		0.07	
<i>Fruits</i>	0.301 (0.0206)	***	0.007 (0.0040)	*	0.008 (0.0054)		0.10	
<i>Milk</i>	0.119 (0.0111)	***	0.004 (0.0025)	*	0.008 (0.0032)	*	0.05	**
<i>Dairy</i>	0.345 (0.0137)	***	-0.001 (0.0027)		0.002 (0.0036)		0.10	
<i>Vegetable fats</i>	0.177 (0.0137)	***	0.000 (0.0028)		0.002 (0.0036)		0.13	
<i>Sugar &amp; Confectionery</i>	0.397 (0.0180)	***	0.004 (0.0036)		0.003 (0.0047)		0.08	
<i>Fish</i>	0.182 (0.0203)	***	0.000 (0.0042)		-0.002 (0.0054)		0.08	
<i>Coffee &amp; Tea</i>	0.183 (0.0148)	***	0.001 (0.0032)		-0.003 (0.0042)		0.12	
<i>Beverages</i>	0.234 (0.0262)	***	-0.001 (0.0051)		0.003 (0.0069)		0.13	
<i>Alcohol</i>	0.250 (0.0252)	***	0.000 (0.0044)		0.003 (0.0060)		0.11	
<i>Tobacco</i>	0.159 (0.0128)	***	0.000 (0.0027)		0.001 (0.0035)		0.14	

\* 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 a set of community food prices.

The elasticities of quality are presented in Table 3. A relatively high elasticity of 0.63 for the average cost per calorie confirms the findings from the quantity regressions. The relatively low elasticities for the single food groups imply that lower per-unit food costs are mainly the result of shifts from food groups that provide expensive energy to those that provide cheap energy rather than of quality shifts within one category. The highest elasticities could be found for fish (0.19), sugar & confectionery (0.13), coffee & tea (0.12), alcohol (0.10), and tobacco (0.11), whereas the more basic food groups show somewhat lower values ranging from 0.01 for cereals to 0.09 for vegetables. Remarkably, nearly all of the elasticities are significantly higher for obese households. In percentage terms, these deviations are quite large: obese show an 18% higher elasticity of quality for meat, 21% higher for bread, 16% for fruits, and 18% for dairy. This clearly points to a greater flexibility of obese households in the choice of quality. Although the absolute deviations are not very large, they are highly significant, and the relative differences are substantial. Figure 2 in the Appendix illustrates the typical pattern of unit values of meat and vegetables for obese, overweight and normal households over time. Although the differences are not large, there is a clear tendency of lower unit values for obese households.

<sup>7</sup> These figures are computed as the relation of the deviation of overweight/obese households to the elasticity of normal households. E.g. for potatoes and obese:  $0.027/0.433 = 0.062 = 6\%$ .

**Table 3: Fixed-effects regression estimates of the total per-capita expenditures elasticity of quality for several product groups**

	$\beta_1$			$\beta_2^* = \beta_2 - \beta_1$			$\beta_3^* = \beta_3 - \beta_1$			$R^2$	$\beta_3^* = 0$
<i>Energy</i>	0.631	(0.0114)	***	0.002	(0.0019)		0.004	(0.0024)	*	0.35	*
<i>Meat</i>	0.066	(0.0077)	***	0.004	(0.0017)	**	0.012	(0.0022)	***	0.59	***
<i>Bread</i>	0.042	(0.0057)	***	0.004	(0.0014)	**	0.009	(0.0019)	***	0.58	***
<i>Cereals</i>	0.010	(0.0086)		0.003	(0.0018)	*	0.007	(0.0023)	***	0.41	***
<i>Potatoes</i>	0.028	(0.0168)	*	0.000	(0.0034)		0.001	(0.0043)		0.49	
<i>Vegetables</i>	0.092	(0.0150)	***	0.002	(0.0037)		0.010	(0.0046)	**	0.37	**
<i>Fruits</i>	0.075	(0.0151)	***	0.004	(0.0031)		0.012	(0.0042)	***	0.29	***
<i>Milk</i>	0.082	(0.0093)	***	0.006	(0.0020)	***	0.008	(0.0026)	***	0.50	***
<i>Dairy</i>	0.071	(0.0100)	***	0.007	(0.0022)	***	0.013	(0.0028)	***	0.33	***
<i>Vegetable fats</i>	0.043	(0.0091)	***	0.003	(0.0020)		0.007	(0.0025)	***	0.47	***
<i>Sugar &amp; Confectionery</i>	0.128	(0.0121)	***	0.003	(0.0026)		0.009	(0.0034)	***	0.26	***
<i>Fish</i>	0.188	(0.0273)	***	0.005	(0.0056)		0.013	(0.0069)	*	0.20	*
<i>Coffee &amp; Tea</i>	0.117	(0.0172)	***	0.012	(0.0036)	***	0.011	(0.0049)	**	0.28	**
<i>Beverages</i>	0.050	(0.0213)	**	0.004	(0.0047)		0.006	(0.0062)		0.20	
<i>Alcohol</i>	0.104	(0.0216)	***	0.004	(0.0045)		0.010	(0.0059)	*	0.24	*
<i>Tobacco</i>	0.105	(0.0120)	***	0.005	(0.0027)	*	0.016	(0.0037)	***	0.42	***

\* 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 a set of community food prices.

## 5 Discussion and Conclusion

The present analysis sought to identify whether households that have more overweight and obese members react differently to income changes than their normal-weight counterparts. It is the first study that explicitly addresses changes in food expenditures, food quantities and food quality segmented by body weight. Using data from the Russia Longitudinal Monitoring Survey, households were classified into normal, overweight and obese and expenditure elasticities of food expenditures, food quantities and food qualities were estimated for each group. The analysis accounted for unobserved household heterogeneity via fixed-effects. A series of Wald tests then tested for differences in the elasticities across weight groups. We found that obese households showed significantly higher elasticities than normal-weight households, mainly with regard to their quality reactions. Obese households' expenditure elasticities of quality for meat, bread, fruits, and dairy were 15-20% higher than those of normal households. Differences among the elasticities of food expenditures and food quantities were less obvious. Obese households showed higher elasticities of total food expenditures as well as of expenditures and quantities for potatoes and milk. No differences were found in the elasticity of total energy intake.

Although the magnitude of the differences is not very large, there is a clear tendency of obese households to react more flexible to changes in their economic resources, mainly by altering the quality of food products that they purchase. Additionally, descriptive statistics indicate that obese households in Russia tend to pay less per unit for many food groups and seem to trade off quality for quantity.

However, these figures represent the situation in Russia, where obesity and overweight are more prevalent at higher-income levels that can afford purchasing more *and* better food. The situation might be different in industrialised societies, where obese people can mostly be

found in low-income households. Possible deviations in behaviour across countries should be subject to empirical analysis. However, regressions stratified by income tertiles showed similar patterns for the medium and bottom income tertile. Further differences between Russia and Western economies might arise from the much higher degree of product differentiation in the West during the analysed period that allow people to choose among lots of more products of different quality and price and make it easier to change the price per calorie under economic pressure. For Canada, Beatty (2007) reports expenditure elasticities of quality for beef of 0.09, for cheese (0.058), fresh fruits (0.127), and fresh vegetables (0.102) that are slightly higher than found in this paper for Russia. The only exception is milk with 0.07 what might be due to a higher standardisation level.

The present results have important implications for policy measures. When people manage to maintain their energy intake during a severe crisis, fiscal instruments like fat taxes will presumably not have any considerable impact on overweight and obesity. Especially obese households seem to be able to cushion price changes by switching to less expensive food items without changing their overall energy intake considerably. Then, less flexible normal-weight households bear a higher burden imposed by such a tax as they won't change their per-unit expenditures as much as the obese. Studies that discussed distributional effects of those taxes mostly argue that lower-income groups are more likely to change their consumption behaviour and are those with higher prevalence of obesity. Hence, taxes might not be regressive and fulfil their purpose. However, the present findings have to be considered carefully when designing fiscal measures to reduce overweight and obesity like for instance fat taxes.

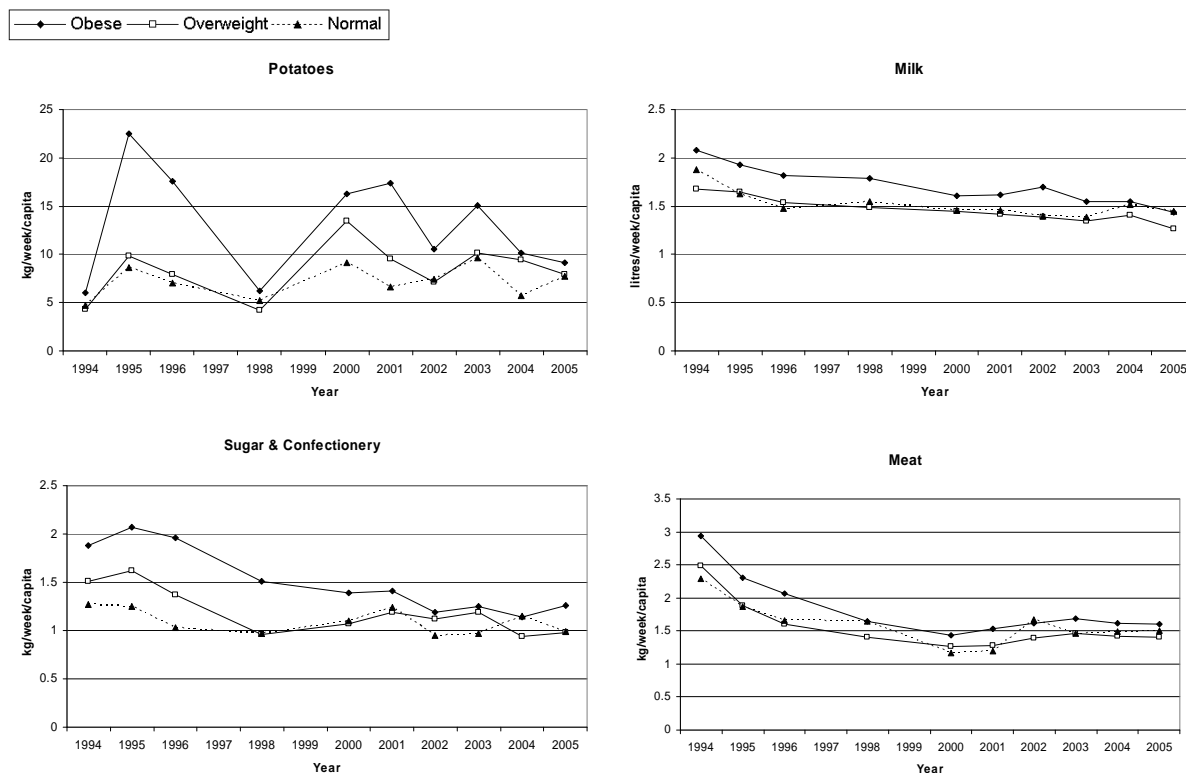
## 6 References

- Allais, O., Bertail, P., Nichèle, V., (2010). The Effects of a Fat Tax on French Households' Purchases: A Nutritional Approach. *American Journal of Agricultural Economics* 92, 228-245.
- Beatty, T.K.M., 2007. The Scope of the Unit Value Problem. *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, 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.
- Cash, S.B., Lacanilao, R.D., 2007. Taxing Food to Improve Health: Economic Evidence and Arguments. *Agricultural and Resource Economics Review* 36, 174-182.
- Cash, S.B., Sunding, L., Zilberman, D., 2005. Fat taxes and thin subsidies: Prices, diet, and health outcomes. *Acta Agriculturae Scandinavica, Section C – Food Economics* 2, 167-174.
- Chouinard, H.H., Davis, D.E., LaFrance, J.T., Perloff, J.M., 2007. Fat Taxes: Big Money for Small Change. *Forum for Health Economics & Policy* 10(2).
- 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.
- Cutler, D.M., Glaeser, E.L., Shapiro, J.M., 2003. Why Have Americans Become More Obese? *Journal of Economic Perspectives* 17, 93-118.

- 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.
- Gould, W. (2002), Chow tests. STATA FAQs. Available online: <http://www.stata.com/support/faqs/stat/chow3.html>. Access: August 17, 2010.
- Gustavsen, G.W., Rickertsen, K., 2009. The effects of taxes on purchases of sugar-sweetened carbonated soft drinks: a quantile regression approach. *Applied Economics*, 1466-4283, First published on 08 June 2009, DOI: 10.1080/00036840802599776.
- 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-hse/project/samprep>. Access: February 14, 2010.
- 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.
- Kuchler, F., Tegene, A., Harris, J.M., 2005. Taxing Snack Foods: Manipulating Diet Quality or Financing Information Programs? *Review of Agricultural Economics* 27, 4-20.
- 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. *Papers on Economics and Evolution* No. 09/13, Max Planck Institut of Economics, Jena, Germany.
- Mroz, T.A., Popkin, B.M., 1995. Poverty and the Economic Transition in the Russian Federation. *Economic Development & Cultural Change* 44, 1-31.
- Norström, J., Thunström, L., 2010. Can targeted food taxes and subsidies improve the diet? Distributional effects among income groups. *Food Policy*, <http://dx.doi.org/10.1016/j.foodpol.2010.11.023>.
- 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.
- Powell, L.M., 2009. Fast food costs and adolescent body mass: Evidence from panel data. *Journal of Health Economics* 28, 963-970.
- Powell, L.M., Bao, Y., 2009. Food prices, access to food outlets and child weight. *Economics and Human Biology* 7, 64-72.
- RLMS (Russia Longitudinal Monitoring Survey), 2011. Sampling Overview, available at <http://www.cpc.unc.edu/projects/rlms-hse/project/sampling>. Access: February 14, 2011.
- Sedik, D., Sotnikov, S., Wiesmann, D., 2003. Food Security in the Russian Federation. *FAO Economic and Social Development Paper* No. 153. FAO, Rome.
- Smed, S., Jensen, J.D., Denver, S., 2007. Socio-economic characteristics and the effect of taxation as a health policy instrument. *Food Policy* 32, 624-639.
- Stillman, S., Thomas, D., 2008. Nutritional status during an economic crisis: Evidence from Russia. *The Economic Journal* 118, 1385-1417.
- 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.
- Ulijaszek, S.J., Koziel, S., 2007. Nutrition transition and dietary energy availability in Eastern Europe after the collapse of communism. *Economics and Human Biology* 5, 359-369.
- 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

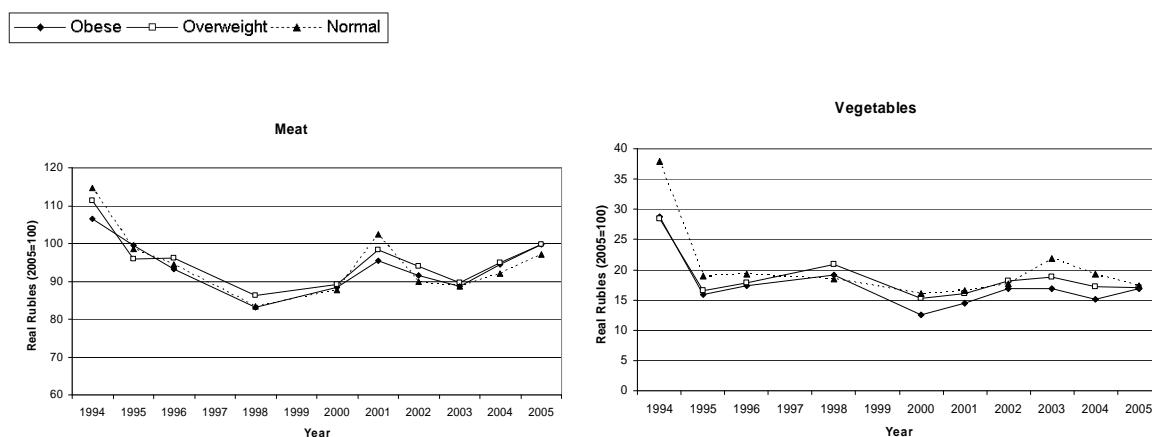
## Appendix

Figure 1: Quantities purchased per capita and per week over time



Source: RLMS, 1994-2005.

Figure 2: Unit Values for selected food groups in real rubles (2005=100).



Source: RLMS, 1994-2005.