The impact of food and economic crises on diet and nutrition

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Abstract

Skyrocketing staple food prices in combination with falling incomes around the world raised serious concerns among policy makers, media and the public at large over the past few years. We rigorously explore the dietary and nutritional implications of such shocks in a before, during and after manner. We find not only a tendency of households to reallocate their consumption baskets during a crisis, but also a dramatic change in the income and price elasticities of demand for both food and nutrients. Our results challenge the implicit assumption of relatively low and invariable price and income elasticities of demand for food and nutrition in the existing literature and have potentially important policy implications.

Keywords: Crisis, Diet, Fluctuation, Health, Nutrition

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1. Introduction

The welfare implications of the recent global crises on the poor, especially those living in some of the poorest countries in the world, have been among the most high-profile areas of policy discussion and media coverage in the past few years. A large number of policy research papers, typically written under the auspices of the Food and Agricultural Organization (FAO) of the United Nations and the World Bank, have tried to identify the net losers from the *global food crisis*, a term popularly used to describe the rising staple and other food prices in 2008 and later.[1] Their general consensus is that net food-importing countries, which typically fall in the category of poorest countries in the world - and in particular the poor urban deciles of their populations - are among the largest victims of food price inflation.

Welfare-related concerns have been further aggravated by the severe income shock in the aftermath of the global financial crisis, accounting for an estimated 73 million additional people living below $1.25 a day and 91 million additional people living under $2 a day within the two years subsequent to the 2008 global financial meltdown (Chen and Ravallion, 2009). Of special concern is the immediate effect of the crises on nutrition and health (Development Research Group, 2008). While the nutritional consequences are bound to be largest for the poor in less developed countries, no economy is immune to the combined effect of food price inflation and declining incomes.

Although rigorous academic research has attempted to keep up with the policy concern by providing estimates of nutritional and other consequences of price and income shocks, the effort has yet been inadequate. For example, the prolific post-2008 literature on the effect of rising staple food prices is dominated by (i) simulations based on computable general equilibrium models, a methodology criticised for its black-box type of analysis, and (ii) studies trying to identify the impact of the price increase of a particular food item, e.g. rice or wheat, on the welfare of net buyers of that particular food item. While providing a rigorous picture of the number and poverty levels of those affected by a price shock, conditional on everything else in the world remaining the same, these studies fail to account for the possibility that a price shock may induce consumers to reallocate their food baskets towards cheaper food items, an action with *ex ante* unclear nutritional consequences.

A serious constraint to truly comprehensive research on the implications of the recent price and general economic shocks on consumption and nutrition is the scarcity of data rich enough to allow the researcher to explore the shock implications in a before and after manner. To the best of our knowledge, only Ecker and Quaim (2010) consider the possibility that a price shock on specific food groups could induce reallocation of consumption and nutrition. However, their analysis is based on a single cross-section of data and corresponding simulations that assume unchanging food and nutrient elasticities, despite the possibility that severe price and/or

[1] See, for instance, the Policy Research Working Paper series 4738-4745 and similar FAO publications such as Zezza et al (2009).

economic shocks may induce a structural break and hence completely change consumer behaviour (Aker et al, 2011).

The broader empirical literature, focusing on price and nutrient elasticities of consumption and nutrition, is typically based on single cross-sections of data, often from fairly uneventful periods of time. The general finding is that food consumption, especially of staple foods, is generally income and/or price inelastic (Berhman and Deolalikar, 1987; Diagana et al, 1999). While some studies find deleterious nutritional implications of price inelastic demand for food in the face of a severe price shock (Diagana et al, 1999), others find income elasticities of nutrients to be smaller than the corresponding food elasticities, exemplifying greater willingness of households to compromise on tastes than on nutritional value (Behrman and Deolalikar, 1987), thus explaining the absence of visible nutritional and health implications of even severe economic crises, such as that of 1998 in Russia (Stillman and Thomas, 2008).

The purpose of this paper is to fill some of the gaps outlined above and attempt to explain some of the existing controversies in the literature by using the natural experiment of Bulgaria in the mid-1990s to early 2000s. The context and timing are ideal for exploring the implications of severe income and price shocks, as well as the role of changing relative food prices on consumption and nutrition. Almost nowhere was the shock of structural reform and crisis as severe as in Bulgaria during the 1990s. The dissolution of the Council for Mutual Economic Assistance (CMEA), the war in former Yugoslavia, and policy stalemates, all led to a greater drop in output and higher inflation than in the majority of the Central and East European (CEE) countries, culminating in the crisis of 1996-97. While the crisis in Russia led to a 40 percent increase in inflation, from 20 percent to 60 percent t between 1996 and 1997, inflation in Bulgaria increased by 827 percent, from the already high base of 122.9 percent. Lifetime savings were lost.

Poverty incidence increased by 77 percent (Sahn et al, 2002), while the fall in food consumption exceeded that of the majority of the CEE countries (Elsner and Hartmann, 1998). There is evidence that consumption of meat and commercially produced bread must have been the most affected, as both income decline and agricultural sector problems made the production of grains and livestock especially problematic and contributed to a significant increase in their prices (Ivanova et al, 2006). Examples include the increased price of a standard white bread loaf from 15.66 levs in 1995 to 545 levs in 1997, the increased price of a kg of pork from 204.10 levs in 1995 to 5325 levs in 1997 and the increased price of a kg of beef from 158.44 levs in 1995 to 2988 levs in 1997 (National Statistical Office of Bulgaria, 2000).

With the use of uniquely timed data - from before the crisis of 1996, through the crisis of 1996-97, until the crisis-free year 2001 - we explore the reaction of household consumption and nutrition to changing food prices and incomes. To fully understand the welfare implications of the price and income shocks, we estimate the price and income elasticities of food and nutrition for households belonging to the poorest, middle income and richest percentiles in the income distribution. We find not only a tendency of households to reallocate their consumption baskets during a crisis, but also a dramatic change in the income and price elasticities of demand for both food and nutrients. Our results challenge the implicit assumption of relatively low and invariable price and income elasticities of demand for food and nutrition.

In Section 2 we provide a description of the general economic background of this study on Bulgaria and present some consumption and nutrient statistics. In Section 3 we outline the methodologies used to estimate price and income elasticities of food and nutrients. In Section 4 we discuss our results on income and price elasticities of key food groups, while in Section 5 we discuss the corresponding results on nutrient price and income elasticities. Section 6 concludes.

2. The story of consumption and nutrition in Bulgaria

The main data sources for our analysis are the Living Standards Measurement Surveys (LSMS) for 1995, 1997 and 2001, provided by the World Bank.[2] The surveys provide detailed information on monthly food consumption and expenditures, total expenditures and incomes, demographic and other characteristics of interest from approximately 2,500 randomly selected households in each of the three cross-sections.[3] We supplement these data with data on the nutrient composition of all food groups consumed, collected by the National Centre of Public Health Protection in Bulgaria.[4]

A preliminary analysis of the data shows that average monthly real incomes declined dramatically, from 120.8 levs to 86.68 levs between 1995 and 1997, and then grew back to approximately their original levels by 2001. There is evidence that the dramatic changes in incomes may have influenced food expenditures significantly (Ivanova et al, 2006), and we would like to explore this possibility as a first step in our descriptive analysis. Table 1 highlights the percentage changes in the food baskets of households belonging to different segments of the 1995 income distribution between 1995 and 1997 and between 1997 and 2001.

To keep our terms of reference broadly the same over time, we follow a procedure similar to that used by the LSMS team in constructing comparable poverty lines over time. Specifically, we allocate households into income percentiles in 1995. We then adjust the reference income of households for inflation and define the percentile distribution of households in 1997 and 2001

[2] While a survey for 2003 is also available, it differs significantly from the three earlier surveys, making comparisons across the four cross-sections difficult. The Bulgarian economy stabilised significantly after 2000 and we do not expect major changes to have taken place between 2001 and 2003 in the phenomena and indicators in which we are interested.
[3] Specifically, the surveys include information on 2,468 households in 1995, 2,323 households in 1997 and 2,633 households in 2001.
[4] We thank Ludmila Ivanova and Plamen Dimitrov for making these data available to us.

Table 1: Changes in the budget share of key food groups, 1995-1997-2001

Variable	1995	1997	2001
10th percentile			
Bread	0.15 (0.10)	0.26 (0.13)	0.22 (0.12)
Starches	0.15 (0.08)	0.14 (0.10)	0.16 (0.08)
Meat	0.21 (0.11)	0.19 (0.12)	0.18 (0.11)
Fruit, vegetables	0.18 (0.10)	0.14 (0.10)	0.14 (0.10)
Oil-fat	0.05 (0.03)	0.04 (0.03)	0.06 (0.04)
Dairy products	0.22 (0.11)	0.18 (0.12)	0.19 (0.11)
Sweets	0.04 (0.03)	0.05 (0.06)	0.04 (0.04)
25-50th percentile			
Bread	0.10 (0.07)	0.16 (0.08)	0.16 (0.09)
Starches	0.12 (0.06)	0.11 (0.06)	0.13 (0.06)
Meat	0.24 (0.11)	0.28 (0.13)	0.23 (0.11)
Fruit, vegetables	0.22 (0.12)	0.20 (0.13)	0.18 (0.10)
Oil-fat	0.05 (0.05)	0.04 (0.03)	0.05 (0.03)
Dairy products	0.20 (0.12)	0.16 (0.09)	0.19 (0.10)
Sweets	0.06 (0.04)	0.06 (0.05)	0.06 (0.04)
90th percentile			
Bread	0.06 (0.08)	0.08 (0.05)	0.11 (0.10)
Starches	0.08 (0.04)	0.08 (0.05)	0.11 (0.09)
Meat	0.32 (0.12)	0.41 (0.15)	0.28 (0.15)
Fruit, vegetables	0.26 (0.11)	0.21 (0.11)	0.19 (0.10)
Oil-fat	0.04 (0.05)	0.04 (0.02)	0.04 (0.03)
Dairy products	0.17 (0.10)	0.15 (0.05)	0.18 (0.10)
Sweets	0.08 (0.05)	0.05 (0.04)	0.08 (0.07)

Source: Own calculations based on the LSMS data set. Notes: shares (standard errors). See the text for a description of percentiles determination. Briefly, for 1995 we use actual percentiles, for 1997 and 2001 the division between the reported 'percentiles' refers to the 1995 boundaries for these percentiles, appropriately adjusted for inflation.

accordingly. For example, let the 10th percentile in 1995 include households whose incomes lie between 0 and X levs. In defining the 10th percentile in 1997, we adjust X for inflation and include in the 10th percentile of the 1997 distribution households whose incomes lie between 0 and X/CPI levs. Hence, while for 1995 we are dealing with the actual percentiles as stated, for 1997 and 2001 the division between the reported 'percentiles' in fact refers to the 1995 boundaries for these percentiles, appropriately adjusted for inflation. In this way we are looking at 'absolute' as opposed to 'relative' welfare measures and their real changes over time.

Using real thresholds constructed in this manner enables us to examine from survey to survey the variation in consumption of the set of households with the same real expenditures. These are not the same households in each quintile over time, so we are not tracing how the crisis affects the positioning of households in the income distribution. Rather, we are looking at the how households with the same expenditures change their consumption of food items and nutritional intake in response to price and income changes.

Perhaps the most striking observation from Table 1 is the significantly larger proportion of bread and starches in the food basket of the poorer percentiles and the significantly larger proportion of meat in the food basket of the richest percentiles throughout the period. During the crisis, the proportion of bread in the food basket of all groups of consumers increased, while the proportion of meat decreased slightly for the poorest percentiles and went up significantly for the richest percentiles. After the crisis, consumption patterns shifted back towards their original positions, but never returned to their pre-crisis levels.

Average caloric intake decreased significantly during the crisis for all income percentiles and started recovering afterwards, though never returning to pre-crisis levels (Ivanova et al., 2006). Furthermore, the nutrient composition of the diet shifted, with a lower intake of fats and a higher intake of proteins and carbohydrates during the crisis (Figure 1).[5]

Given the complexity of the economic situation during the focus period, it is difficult to attribute changes in consumption and nutrition to one particular factor. Thus, the changes could have been driven by either the reduction of purchasing power alone, or changing relative prices of key food items or change in the responsiveness of households to these incomes and prices. From a policy making perspective, it is instructive to disentangle the implications of all of these influences.

Unfortunately, we do not have access to reliable prices at either the household or regional level. We must extract price related information from the available evidence on unit values - total expenditures divided by total quantities of food items - a problem as unit values reflect the quality choices that households make as well as the prices that they face (Prais and Houtakker, 1955). We discuss and rigorously address this issue in our empirical analysis. However, as a first attempt at making price related sense of the information available, it is useful to look at the changes in unit values of key food groups.

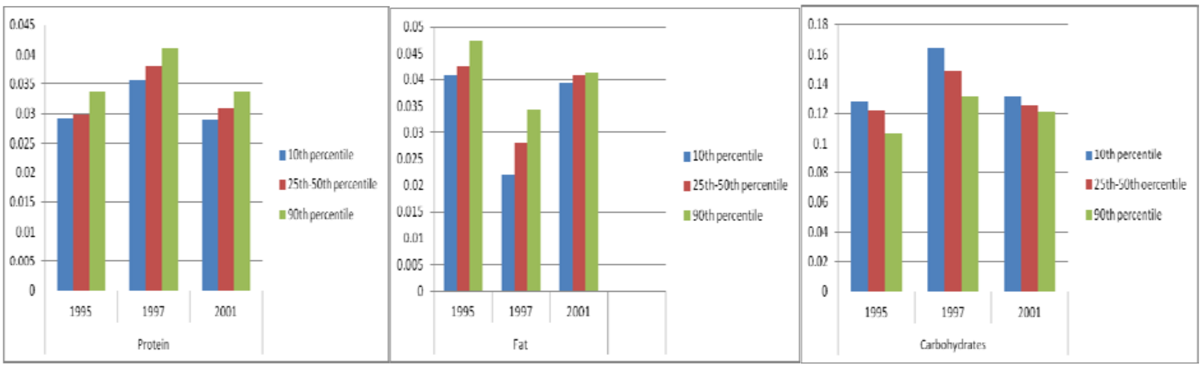
The information on unit values reported in Table 2 is consistent with observed consumption patterns and provides some tentative explanation of these patterns that goes beyond that of shifting real incomes over time. In particular, we see that in each of the years, the unit values of

[5] Given the limited space and the large amount of information, we must carefully choose which pieces to report. In this diagram and subsequent empirical analysis of nutrition we focus only on macronutrients. Note that our micronutrient information indicates that, as expected, the proportion of all micronutrients in the diet - niacin, iron, calcium, thiamine and riboflavin - decreased during the crisis and did not return to its original level by 2001.

meat significantly exceed the unit values of staple foods, which is consistent with the apparent greater ability of the richer strata of the population to afford meat compared to those belonging to the poorer percentiles[6]. In addition, the significant increase in the unit value of bread between 1995 and 1997 and the corresponding rise of the share of bread in the food basket of all income percentiles possibly indicates low elasticity of bread - Bulgaria’s main staple food - to price changes. Given that meat and staple foods (bread and starches) are the main items in Bulgaria’s food basket and that some of the most noticeable results in both our descriptive and subsequent empirical analysis are related to these food items, we will focus on them in the description of our elasticity estimates. The full set of empirical results is available in our full technical appendix, which is available upon request.

Figure 1: Changes in nutrient consumption

Share of proteins   Share of fats   Share of carbohydrates



Source: Own calculations based on the LSMS and data on the nutrient composition of all food groups consumed, collected by the National Centre of Public Health Protection in Bulgaria. Notes: The figure highlights the total monthly calories averaged across percentiles defined on the basis of per adult equivalent expenditures See text and Table 1 for a description of percentiles determination.

[6] Note that this information is consistent with information on aggregate yearly prices of food items, provided by the National Statistical Institute of Bulgaria.

Table 2: Average unit values of key food groups, 1995-1997-2001

Variable	1995	1997	2001
10th percentile			
Bread	0.62 (2.57)	0.86 (0.44)	0.63 (0.15)
Starches	1.33 (0.41)	1.13 (3.13)	0.89 (0.29)
Meat	5.03 (1.08)	5.30 (2.81)	3.69 (0.97)
Fruit, vegetables	1.17 (0.46)	1.02 (0.61)	1.08 (0.61)
Oil-fat	1.98 (0.41)	1.38 (1.01)	1.60 (0.31)
Dairy products	1.60 (1.45)	1.73 (1.69)	1.52 (0.74)
Sweets	1.34 (0.56)	1.29 (0.80)	1.14 (0.94)
25-50th percentile			
Bread	0.62 (2.57)	0.89 (0.59)	0.67 (0.60)
Starches	1.29 (0.36)	0.99 (0.47)	0.92 (0.28)
Meat	5.66 (1.25)	6.11 (2.37)	4.23 (1.18)
Fruit, vegetables	1.28 (0.48)	1.21 (0.68)	1.03 (0.46)
Oil-fat	2.31 (1.19)	1.71 (0.93)	1.71 (0.52)
Dairy products	1.78 (2.64)	1.63 (0.94)	1.86 (3.07)
Sweets	1.30 (0.71)	1.40 (0.95)	1.14 (0.62)
90th percentile			
Bread	0.71 (2.44)	0.87 (0.15)	0.75 (0.83)
Starches	1.40 (0.38)	0.95 (0.27)	0.99 (0.49)
Meat	6.42 (1.38)	6.78 (1.51)	4.68 (1.72)
Fruit, vegetables	1.53 (0.45)	1.19 (0.59)	1.17 (0.60)
Oil-fat	2.56 (0.89)	2.24 (1.16)	1.82 (0.62)
Dairy products	2.10 (2.62)	1.98 (1.13)	2.33 (3.42)
Sweets	1.44 (0.70)	1.10 (0.67)	1.26 (0.82)

Source: Own calculations based on the LSMS data set. Notes: The values are expressed in real 2001 terms. The numbers in brackets are standard deviations. See text and Table 1 for a description of percentiles determination.

3. Econometric methodology

3.1. Estimation of income and price elasticities of food intake

The main shortcoming of our data is the absence of information on prices and hence the need to infer responses of households to price changes on the basis of information on unit values. For instance, we are likely to observe higher unit values for households whose basket consists of higher quality items. Unlike the market price, over which an individual household does not have any control, the unit value represents a choice variable, which is under the control of households. If, therefore, we are to infer price elasticities on the basis of unit value data, our results are likely to be tarnished by a simultaneity bias: households choose both the quantity and the quality of a good, and better-off households would tend to buy higher quality goods, whose unit value is positively related to total financial outlays.

To overcome this problem and produce unbiased estimates of price elasticities, we implement the Crawford et al (2003) model, whose main advantage over alternative models is that it allows us to exploit the explicit links between unit values and prices in a way that is consistent with the Almost Ideal Demand System (AIDS) approach. In keeping with the rest of the literature, foods are organised in m groups (bread, starches, meat, etc.). Under the assumptions of separability of preferences and homogeneity, we define the following relationship:

$$V_G = \pi_G h_G\left(V_G Q_G / \pi_G\right), \qquad [1]$$

where V_G is the unit value for group G, Q_G is the corresponding quantity index and homogeneous price index π_G (e.g. a Paasche price index), constructed assuming a constant structure of relative prices within group G. Taking a double logarithm of [1] and given a functional form ϕ_G for the budget shares w_G, we therefore need to estimate a consistent system:

$$\ln V_G = \ln \pi_G + \ln h_G\left[\frac{X}{\pi_G}\phi_G\left(X, \pi\right)\right], \text{ and} \qquad [2]$$

$$w_G = \phi_G\left(X, \pi\right), \qquad [3]$$

where X is total expenditures, and π is a vector of group price levels (the omission of G indicates that these parameters refer to all groups). To make the estimation computationally tractable, a special functional form for h_G is adopted such that:

$$\ln V_G = a_G + b_G \ln Q_G + \ln \pi_G . \qquad [4]$$

As for the functional form of the demand function, ϕ_G , the model uses the approximate Almost Ideal Demand (AID) model with a loglinear approximation of the log index price (LA/AID). While the full AID specification or its quadratic extension would be preferable, the non-linear form would not be tractable by the within-cluster estimation adopted in this method. We attempt to extract at least some of the information that non-linear income specification would provide by estimating price and income elasticities for households belonging to different percentiles of total expenditures.

Assuming fixed prices for households located within a cluster c, the demand function for group G by household h is:

$$w_G^h = \alpha_{0G} + \mathbf{Z}^h \boldsymbol{\alpha}_G + \sum_H \gamma_{GH} \ln \pi_H^c + \beta_G \ln \breve{x}^h + u_G^h , \qquad [5]$$

where $\breve{x}^h$ is deflated expenditure, $\ln \breve{x}^h \equiv \ln X^h - \ln P^C \equiv \ln X^h - \sum_H \lambda_H \ln \pi_H^c$, P^c is a cluster price index with suitably chosen weights, π_H^c is the price of group H in cluster c.
Equation (5) can be re-written as:

$$w_G^h = \alpha_{0G} + \mathbf{Z}^h \boldsymbol{\alpha}_G + \sum_H \delta_{GH} \ln \pi_H^c + \beta_G \ln X^h + u_G^h , \qquad [6]$$

where $\delta_{GH} = \gamma_{GH} - \beta_G \lambda_H$. Vector $\mathbf{Z}^h$ includes socio-demographic characteristics and other conditioning variables.

Following the same logic, the unit value equation becomes:

$$\ln V_G^h = a_{0G} + \mathbf{Z}^h \mathbf{a}_G + \ln \pi_G^c + b_G \ln Q_G^h + v_G^h \cdot \qquad [7]$$

The estimation proceeds under the restricting assumption of independence among observations, as households are grouped by cluster and hence by construction common factors affect the demand for commodities within the cluster. However, under Lewbel's (1993, 1996) assumption of stochastic independence between relative good prices that are allowed to vary across clusters and the cluster price index, this cluster effect can be shown to be innocuous (Crawford et al., 2003).

The estimation proceeds in three stages. In the first stage, we compute the within-cluster estimates, which allow the cancelling of the unobserved price effects and retrieving the estimated vectors $\hat{\boldsymbol{\alpha}}_G$ and $\hat{\mathbf{a}}_G$, and the estimated scalars $\hat{\beta}_G$ and $\hat{b}_G$.

$$\left(w_G^h - \overline{w}_G^c\right) = \left(\mathbf{Z}^h - \overline{\mathbf{Z}}^c\right)\boldsymbol{\alpha}_G + \beta_G\left(\ln X^h - \overline{\ln X}^c\right) + \left(u_G^h - \overline{u}_G^c\right), \qquad [8]$$

and $\left(\ln V_G^h - \overline{\ln V_G}^c\right) = \left(\mathbf{Z}^h - \overline{\mathbf{Z}}^c\right)\mathbf{a}_G + b_G\left(\ln Q_G^h - \overline{\ln Q_G}^c\right) + \left(v_G^h - \overline{v}_G^c\right).$ [9]

The second stage consists of estimating the price coefficients γ_{GH} using between-cluster information, as the fixed nature of the within cluster price effects has already been used in the first stage. At this stage, we impose the standard homogeneity restriction from demand theory, $\sum_H \gamma_{GH} = 0$ (which implies also an adding-up restriction). Vector $\boldsymbol{\lambda}$ is subject to positive linear homogeneity of the price index restrictions $\lambda_G > 0$ and $\sum_H \lambda_H = 1$. Since this is not sufficient to identify the parameters of interest, $\boldsymbol{\lambda}$ is arbitrarily set equal to $\overline{\mathbf{w}}$, the vector of average budget shares. The estimation of $\hat{\gamma}_G$ (the price effects in the budget equation for group G) also assumes homoscedasticity of the variance of $\left(\mathbf{u}^{h'}, \mathbf{v}^{h'}\right)$ and takes into account the measurement errors in the unit values. The resulting relationship is:

$$\hat{\gamma}_G = \left[\sum_{c=1}^{C} n_c \zeta^c \zeta^{c'} - \hat{\boldsymbol{\Omega}}_v\right]^{-1} \left[\sum_{c=1}^{C} n_c \left(\eta_G^c \zeta^c + \beta_G \zeta^c \zeta^{c'} \boldsymbol{\lambda}\right) - \hat{\boldsymbol{\Omega}}_{vu_G} - \hat{\boldsymbol{\Omega}}_{\mathbf{v}} \boldsymbol{\lambda}\right], \quad [10]$$

where,

n_c is the size of each cluster c

$$\eta_G^c \equiv \overline{w}_G^c - \overline{\mathbf{Z}}^c \hat{\boldsymbol{\alpha}}_G - \hat{\beta}_G \overline{\ln X}^c$$
$$= \alpha_{0G} + \sum\left(\gamma_{GH} - \beta_G \lambda_H^c\right) \ln \pi_H^c + \overline{u}_G^c$$

$\zeta^c = \left(\zeta_1^c, \ldots \zeta_m^1\right)'$, with

$$\zeta_G^c \equiv \overline{\ln V_G}^c - \overline{\mathbf{Z}}^c \hat{\mathbf{a}}_G - \hat{b}_G \overline{\ln Q_G}^c$$
$$= a_{0G} + \ln \pi_G^c + \overline{v}_G^c \qquad G = 1, \ldots m,$$

$\hat{V}\begin{pmatrix} \overline{u}_G^c \\ \overline{\mathbf{v}}^c \end{pmatrix} = \frac{1}{n_c}\begin{bmatrix} \hat{\boldsymbol{\Omega}}_{u_G} & \hat{\boldsymbol{\Omega}}_{u_G \mathbf{v}} \\ \hat{\boldsymbol{\Omega}}_{\mathbf{v}u_G} & \hat{\boldsymbol{\Omega}}_{\mathbf{v}} \end{bmatrix}$ where each term of $\hat{\boldsymbol{\Omega}}$ is obtained from the first stage residuals.

The variance of the price coefficients (without imposing symmetry) is obtained by bootstrapping.

In the third stage, we impose the symmetry, $\gamma_{GH} = \gamma_{HG}$, by minimum distance estimation. By using the efficiency arguments of Kodde et al (1990, theorem 5), we minimise only over γ rather than over γ and β.

Price elasticities are computed for household belonging to the 10th, 25-50th and 90th expenditure percentiles using the formula, $e_{GH} = \left(\gamma_{GH} - \beta_G \tilde{w}_H\right)/\tilde{w}_G - 1_{[G=H]}$.; where $\tilde{w}_G$ and $\tilde{w}_H$ represent the budget shares of group G and group H respectively. Total expenditure elasticities are also computed using the formula, $e_G = 1 + \beta_G / \tilde{w}_G$.

We follow closely the specification proposed by Crawford et al (2003). Since the results from the first two stages are not used in our discussion, we keep the variable description and results from these two stages along with the full set of income and price elasticities only in the full technical appendix to be available electronically in a working paper version of the paper, but publishable upon the discretion of referees and editors.

3.2. Estimation of income and price elasticities of nutrients

To derive nutrient elasticities, we apply Huang's (1996) method, which uses elasticities from standard demand analysis to estimate elasticities of changes in the nutritional content of consumer diets. On the basis of the demand structure for food and the bundle of corresponding nutrient attributes, it is possible to derive the implied relationship between nutrient availability and changes in food prices and incomes. Huang's approach provides information on how to derive the formula from an underlying demand model.

Let a_{ki} be the quantity of the k^{th} nutrient obtained from a unit of the G^{th} food group. The total quantity of that nutrient, ψ_k, obtained from various food groups can be expressed as:

$$\psi_k = \sum_G a_{kG} Q_G . \qquad [11]$$

Equation (11) represents the consumption technology in the sense of Lancaster (1966). It is straightforward to show that:

$$\begin{aligned} d\psi_k/\psi_k &= \sum_H \left(\sum_G e_{GH} a_{kG} Q_G/\psi_k\right)\left(d\pi_H/\pi_H\right) + \left(\sum_G e_G a_{kG} Q_G/\psi_k\right)\left(dX/X\right) \\ &= \sum_H D_{kH}\left(d\pi_H/\pi_H\right) + \rho_k\, dX/X \end{aligned}, \qquad [12]$$

where $D_{kH} = \sum_G e_{GH} a_{kG} Q_G / \psi_k$ is a price elasticity measure capturing the effect of the H^{th} food group price on the availability of the k^{th} nutrient; $\rho_k = \sum_G e_G a_{kG} Q_G / \psi_k$ is an income (or total expenditure) elasticity measure relating the effect of a change in income on the availability of that nutrient. In other words, the measurement of D_{kH} represents the weighted average of all own- and cross-price elasticities $\left(e_{GH}{}^{'}s\right)$ in response to a change in the H^{th} price, with each weight expressed as the share of each food group's contribution to the k^{th} nutrient $\left(a_{kG}Q_G/\psi_k{}^{'}s\right)$. Similarly, ρ_k represents the weighted average of all income elasticities $\left(e_G{}^{'}s\right)$, with each weight expressed as the share of each food's contribution to the k^{th} nutrient. The matrix of nutrient elasticities is thus obtained as the product of nutrient shares of food groups S, and food demand elasticities:

$$N = S \times E \; . \tag{13}$$

As before, we report the full set of macronutrient and micronutrient elasticities in Tables TA12-TA26 of our full technical appendix. In the text, we only focus on a selection of macronutrient elasticities. However, the micronutrient elasticity pattern is consistent with our story line.

4. Econometric results

4.1. Highlights from the first stages of our empirical analysis

The set of variables used in our empirical analysis is described in table TA1 of the appendix. In Tables TA2-TA4, we report the budget share estimates, while in Tables TA5-TA7 of the appendix we report the unit value regressions from the first stage of the empirical analysis, described in Section 3. Since these first stage results are of only marginal importance for our main line of argument, here we focus on only a few technical aspects, which are relevant for the robustness of our key elasticity estimates.

To begin with, we select seven categories of (food) groups for our demand estimations. The choice is constrained by the need to have both quantities and expenditures available. Given that we have no reason to believe that the availability of quantity information is directly related to the structure of preferences, there is also no reason to believe that these preferences are separable in the corresponding partition of goods. To address the potential problem of non-separability of preferences in the partition of modelled and non-modelled goods, we condition the budget shares of the included goods on the expenditures on the excluded goods and durable good ownership (Browning and Meghir, 1991; Crawford et al, 2003). Browning and Meghir (1991) argue that this is an economical way of relaxing separability and still maintaining the focus on our goods of interest.

Homogeneity is imposed by expressing conditioning good expenditures with respect to non-modelled food expenditures (i.e., we divided expenditure of each conditioning good by the expenditure of non-modelled food). To address the problem of zero conditioning expenditure, we include dummy variables, indicating zero spending on conditioning goods. This allowed us to keep households with zero conditioning expenditure in our sample (Crawford et al, 2003).

The null hypotheses of non-separability would be rejected if the conditioning goods play no role in the demand equations. Our results in Tables TA2-TA4 indicate that in most instances this is indeed the case: most of the conditioning expenditures do not affect the budget shares of our seven modelled groups. This is particularly true in the case of clothing, shoes and expenditures on furniture, although some exceptions occur at the five percent level of significance and there are changes in relevance of the significant variables over the years.

A second important issue to consider is the potential endogeneity of some of our regressors in the budget share equations. This is particularly the case with the logarithm of total expenditures and durable ownership. To correct for potential endogeneity, we once again followed Crawford et al (2003) in implementing a within-cluster 2SLS estimator, using the set of instruments proposed by these authors. Specifically, we used the logarithm of household total income as an instrument for the logarithm of household total expenditure and quantity of each group, while durable ownership and the conditioning expenditures were instrumented with the use of their cluster means. The exclusion restrictions (of instruments) did not pass the Sargan's test; and the Durbin-Wu-Hausman test of endogeneity failed to confirm endogeneity of any of the considered variables; hence, the reported figures are from within-cluster OLS estimation.

In Tables TA2-TA4, we see that during all years, total expenditures have a negative impact on the shares consumed of bread, starches, fats and oils and dairy products and a positive impact on the shares consumed of meat, fruit and vegetables and sweets. These results are consistent with our descriptive statistics on the greater proportions of the latter types of food items in the baskets of richer households. These results confirm the existence of Engel curves in Bulgaria. The rest of our results are consistent with any conventional assumptions. When the unit values are regressed on the corresponding food quantities and other controls (Tables TA5-TA7) the quantity variable is significant, supporting our approach to estimation.[7]

4.2. Income and price elasticities of food groups

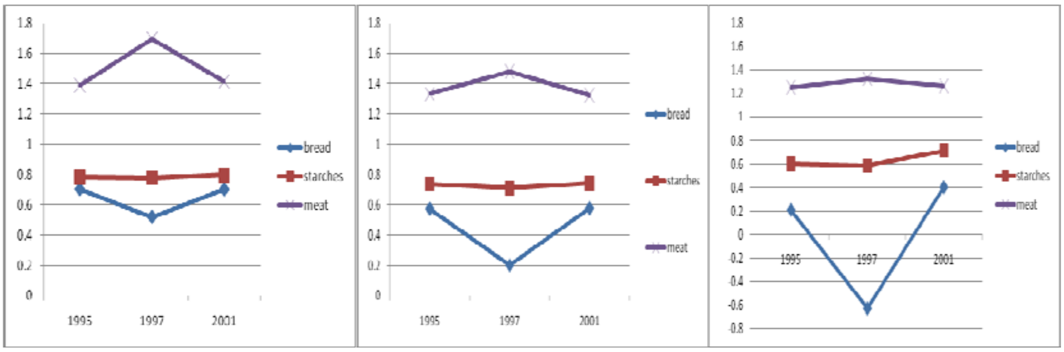
The consumption of specific food items is shaped by what is happening to both relative prices and incomes. The more price and income elastic a food item, the greater the impact of price and income changes on quantities consumed. As we discussed above, in our context the economic crisis sharply lowered incomes between 1995 and 1997 at a time of rapidly changing absolute and relative prices, with some returning to the pre-crisis levels by 2001. To grasp the impact of the crisis on diet we need to examine the changing price and income elasticities over the course of Bulgaria's economic transition.

In this section we report the price and income elasticity of bread, starches and meat consumption, calculated at the real expenditure levels of the 10th, 25-50th and 90th percentiles of per adult equivalent expenditures of the population in each of the available years, where, as indicated earlier, percentiles are fixed in 1995 real terms.

[7] Recently it has been argued (e.g. McKelvey, 2011) that the lack of price data at the individual commodity level presents an insurmountable difficulty for consumption analysis and that even when perfect price data is available, there is still a bias. Our focus is on changing elasticities across the years (rather than a perfect elasticity estimate for each year). The approach we follow provides approximately consistent results under mild versions of traditional assumptions, such as separability.

Figure 2: Income elasticities

Income elasticities, 10th % Income elasticities, 25-50th % Income elasticities, 90th %



Source: Own calculations based on the LSMS data set. Notes: The figure highlights the total monthly calories averaged across percentiles defined on the basis of per adult equivalent expenditures See text and Table 1 for a description of percentiles determination.

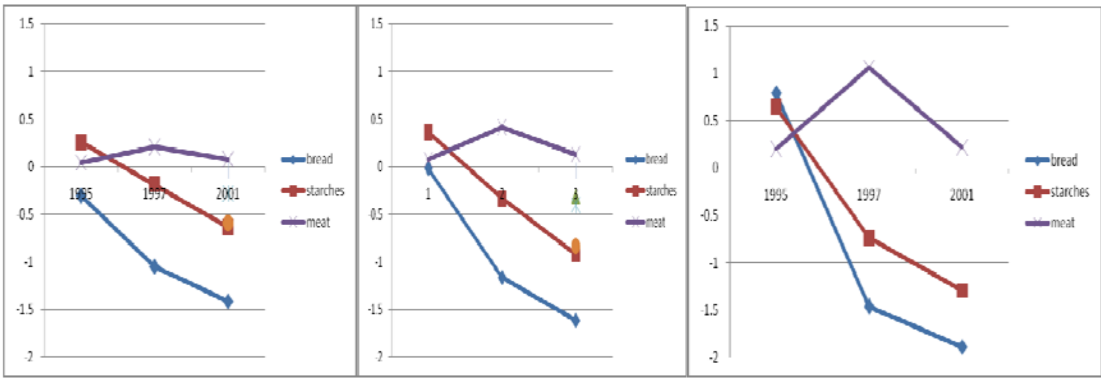
For the sake of visual clarity, the unbiased income elasticities for each of the key food groups in the sample are presented in Figure 2, for each of the years and income percentiles of interest. The actual elasticities and their standard errors are reported in Table TA8 at the end of the text, while estimates for other quintiles are available upon request. We see that during all years and across all income percentiles, meat was a luxury good (income elasticity of demand exceeding one), while bread and starches were necessities (income elasticity of demand between zero and one). However, during the crisis, the positive elasticity of meat increased significantly in the case of the 10th percentile, increased only slightly in the case of the middle percentile and remained almost unchanged for the 90th percentile. At the same time, the income elasticity of bread decreased across all income percentiles and decreased most dramatically for the 90th percentile, for which bread became an inferior good in 1997.

These results are consistent with our observations on changes in the broad consumption patterns across the income percentiles. Meat is a luxury good; this is consistent with our observation from Table 1 that lower income households during the economic crisis reduce their share of household expenditures on meat. Likewise, the share of bread in the household expenditures for all income levels falls, as we expect, given that bread shows up in our estimates as a normal-to-inferior good. However, the increase by households in the higher income percentiles of their consumption of meat - a luxury good - in the face of falling incomes must be influenced to a larger extent by either changing relative prices or different responsiveness to prices. This is not obvious when looking at the unit values in Table 2, but becomes much clearer using our estimates.

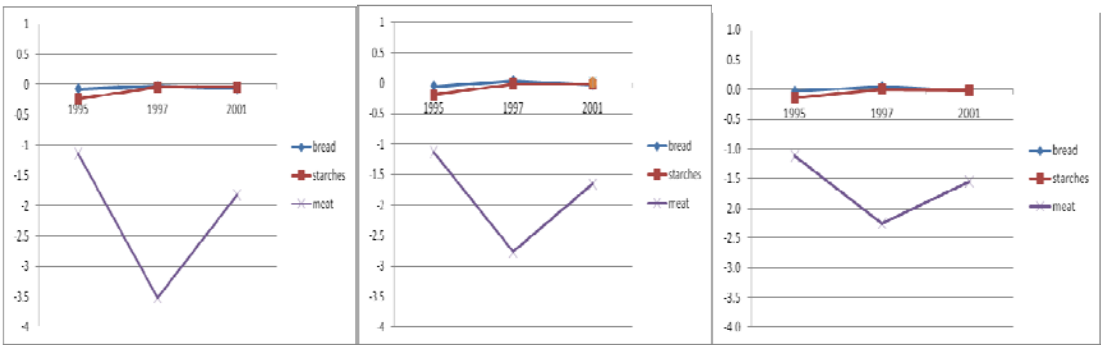
The own-price and cross-price elasticities of the key food groups over time and across income percentiles are summarised in Figure 3 and highlighted in Table TA9 (once again, results for the rest of the per adult equivalent expenditure quintiles are available upon request).

Figure 3: Selected price elasticities

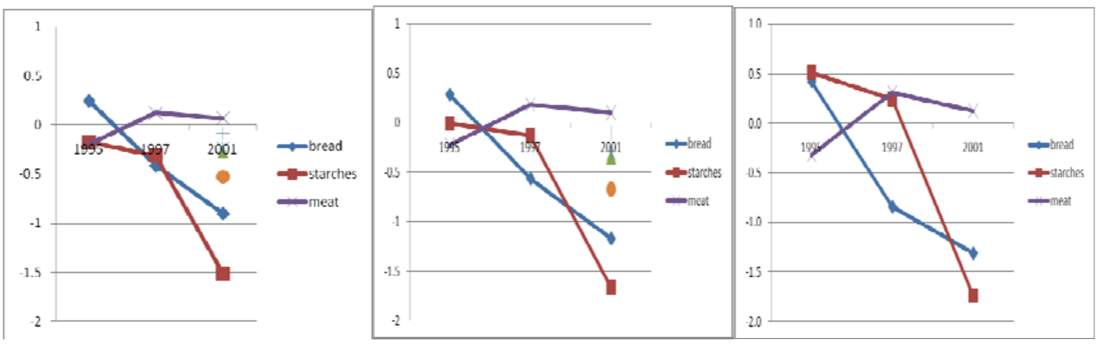
Bread, 10th % | Bread, 25-50th % | Bread, 90th %



Meat, 10th percentile | Meat, 25-50th percentile | Meat, 90th percentile



Starches, 10th % | Starches, 25-50th % | Starches, 90th %



Source: Own calculations based on the LSMS data set. Notes: The figure highlights the total monthly calories averaged across percentiles defined on the basis of per adult equivalent expenditures See text and Table 1 for a description of percentiles determination.

We observe that the own-price elasticities of each of the food groups increased dramatically over time (they become more elastic). We also observe that the substitutability (i.e. the positive cross-price elasticity) between staple foods and meat increased significantly during the crisis.

The consumer behaviour of those belonging to the higher income percentiles was characterised by greater own-price elasticity of staple foods and lower own-price elasticity of meat. The lower price elasticity of meat in the basket of the better-off households provides a trustworthy explanation of their ability to sustain and even increase the consumption of meat during the crisis, when the consumption of meat by the poor went down.

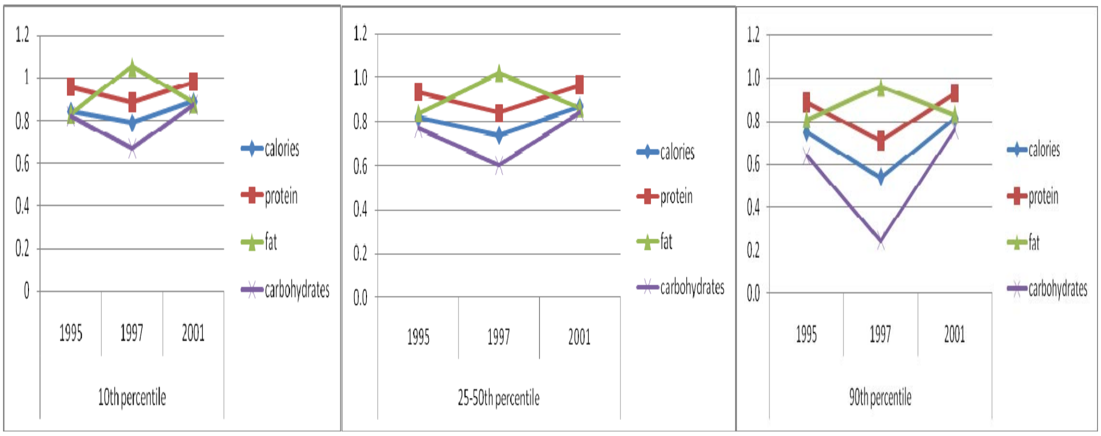
5. Selected income and price elasticities of nutrients

The preceding analysis indicated that the food composition of the Bulgarian diet changed significantly during the crisis. The changes differed across income percentiles and were driven by a complex interplay of changing real incomes and relative prices, as well as changing responses to these incomes and prices. Despite the differences in the changing food composition across income percentiles, different groups of households experienced similar changes in nutrient intakes, which were marked by an increase in the consumption of protein and carbohydrates and a decrease in the consumption of fats across income groups. Since these changes may be indicative of changing responsiveness of nutrients to prices and incomes, we address this possibility in the next and last step of our analysis.

Nutrient elasticity is given by the change in nutrients such as carbohydrates, proteins and fats as food prices change by one percent. The price and income elasticities of nutrients are calculated as in Huang (1996), using the nutrient components of different food groups to convert the estimated price and income elasticities into respective nutrient elasticities, and thus provide us with the elasticities of changes in the nutritional content of consumer diets. As before, we highlight and discuss the income and price elasticity of a selected set of key nutrients and report the full set of elasticities in the full technical appendix. To save space and, given that our main purpose is to explore the dimension and possible change in nutritional responses to changing incomes and prices rather than to analyse in detail each effect, here we focus on macronutrients only. However, an interested reader can also explore in the full technical appendix (available upon request) the micronutrient estimates, which are consistent with our general patterns and message of the paper.

The income elasticities of macronutirents are highlighted in Figure 4 and reported in Table TA10. These elasticities changed significantly during the crisis, when the elasticity of fat increased and the elasticity of other macronutrients decreased substantially. The elasticity of protein, carbohydrates and calories decreased the most in the case of the richest percentiles, undoubtedly due to the better ability of households belonging to this group to afford preserving their nutrient status. These income elasticities provide a convincing explanation of the pattern of nutrient changes that we observed in Figure 1.

Figure 4: Income elasticity of nutrients

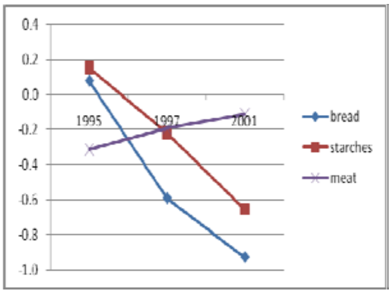


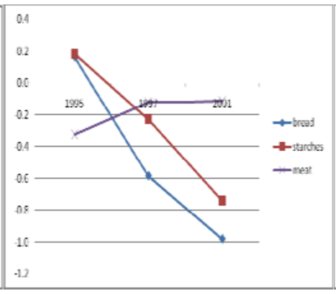
Source: Own calculations based on the LSMS and data on the nutrient composition of all food groups consumed, collected by the National Centre of Public Health Protection in Bulgaria. Notes: The figure highlights the total monthly calories averaged across percentiles defined on the basis of per adult equivalent expenditures See text and Table 1 for a description of percentiles determination.

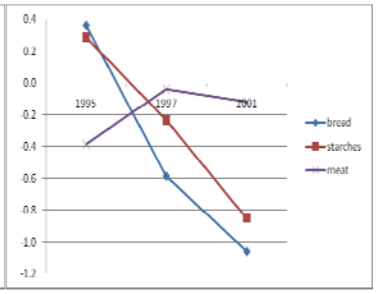
The pattern of price elasticities of nutrients, highlighted in Figure 5 and Table TA11, is also consistent with the rest of our descriptive statistics and empirical results. We see that, over time, the staple food price elasticity of all macronutrients increased significantly, while the meat price elasticity of calories and fats went down between 1995 and 2001. This long-term pattern is consistent with the logic of nutritional transition, characterised by a permanent shift out of staple foods and carbohydrates into meat and the related proteins and fats (Popkin, 1993). However, the change of direction of the meat price elasticity of carbohydrates during the crisis highlights the tendency of households to shift out of fats/proteins into carbohydrates in the face of dramatically increasing meat prices (and vice versa) in periods of economic shocks.

Figure 5: Selected price elasticities of nutrients

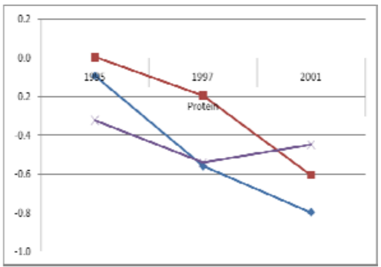
Calories, 10th percentile Calories, 25-50th percentile Calories, 90th percentile

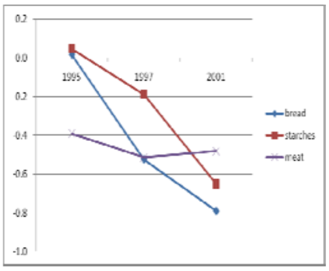


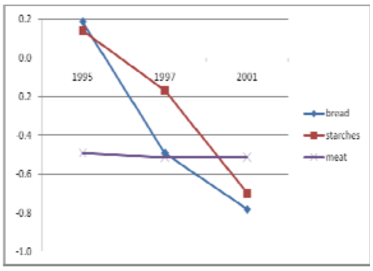




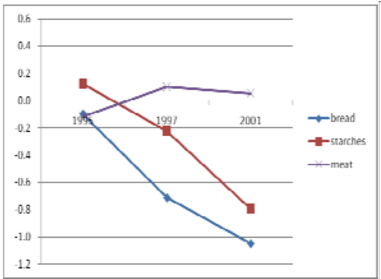
Proteins, 10th percentile Proteins, 25-50th percentile Proteins, 90th percentile

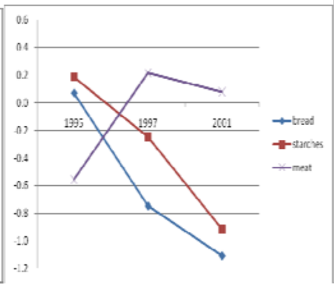


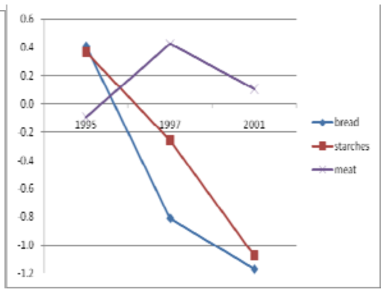




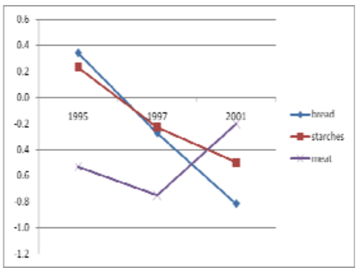
Carbohydrates, 10th percentile Carbohydrates, 25-50th percentile Carbohydrates, 90th percentile

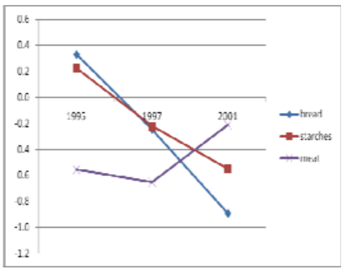


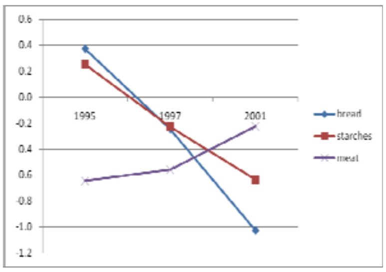




Fats, 90th percentile Fats, 90th percentile Fats, 90th percentile







Source: Own calculations based on the LSMS and data on the nutrient composition of all food groups consumed, collected by the National Centre of Public Health Protection in Bulgaria. Notes: The figure highlights the total monthly calories averaged across percentiles defined on the basis of per adult equivalent expenditures See text and Table 1 for a description of percentiles determination.

6. Conclusion

One of the most challenging research areas of economic and nutrition science research is the ability of individuals and households to smooth their consumption and nutritional stream during food price and general economic shocks. While potential nutritional and health implications of the combined shock of the recent global food and financial crises have been among the main concerns of politicians and journalists, little rigorous research has attempted to unravel their full complexity. Although a few nutrition science studies witness major changes in nutritional behaviour during crises, changes that have potentially important epidemiological consequences (Ivanova et al., 2006), supporters of the permanent income hypothesis postulate an ability of individuals and households to smooth their nutrient stream, even during crises (Stillman and Thomas, 2008). Moreover, the economics literature tends to report relatively low food and nutrient elasticities, as well as evidence, highlighting greater willingness of households to compromise on tastes than on nutritional value over short enough periods of time (Behrman and Deolalikar, 1987).

Using data collected with fortuitous timing - before, during and after a major macro-financial crisis in Bulgaria - we explored the dietary impact not only of falling real incomes in the context of hyperinflation and crisis, but also of changing relative prices and the changing responsiveness of different groups of people to these incomes and prices over six years of fundamental structural reforms of the economy. Our results highlight large and dramatically changing food and nutrient elasticities, which challenge the perception of low and relatively stable price and income elasticities of food and nutrition. In the specific case of Bulgaria, we find a trend consistent with the logic of nutritional transition, expressed in a long-term tendency to substitute staple foods for meat, which is reversed during the crisis, possibly on account of the inability of impoverished households to afford luxury goods such as meat.

Our analysis has several potential limitations related to the data used. While a rigorous econometric methodology helps us overcome the problem of absence of reliable price data, this approach restricts our ability to focus on detailed food items, as opposed to broad food groups. In particular, due to the need to divide food expenditures by the corresponding food quantities to obtain unit value observations, we obtain missing values each time a household does not consume a particular food item. To avoid this problem, we group items into seven broad food groups, unfortunately preventing us from obtaining potentially interesting information on the possible reshuffling of household consumption across narrow food categories. However, our descriptive statistics, e.g. Figure 1, show that the consumption of nutrients, not constrained by food groupings, indeed changed over time.

Despite these shortcomings, which plague the majority of the economics literature on nutrition, our paper is a significant contribution to the both the academic literature and related policy debate. Our most important finding is that of dramatic changes in price and income elasticities of both food groups and nutrients and the tendency of households to reallocate their consumption streams during economic upheavals. It highlights limitations of both studies that assume stable elasticities and base their policy advice on simulations that use household behaviour during a specific past period of time as a point of departure, and/or studies that consider the welfare implications of a price shock focusing on one consumption good at a time and ignoring the possibility of complex reallocations of the consumer basket.

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Appendix

TA1: Definition of variables and description of goods

Variables	Definition
Mother language of head	Mother language of the head; 1 if Bulgarian, 0 otherwise
Age of head	Age of the head in years
Age of head^2/100	Age of the head square divided by 100
Male head	Sex of the head: 1 if Male , 0 otherwise
No school/elementary education of head	No studies, day-care, elementary or preschool of the head: 1 if yes; 0 otherwise
Secondary/middle general education of head	Middle school or general secondary education of the head: 1 if yes; 0 otherwise
Technical /vocational education of head	Technical or vocational secondary education, or other occupation-specific education after secondary of the head, include college (e.g. nurses, police): 1 if yes; 0 otherwise
University of head	University education of the head: 1 if yes; 0 otherwise
Married head	Marital situation of the head: 1 if married, 0 otherwise
Urban	Residence location; 1 if urban, 0 otherwise
Household size	Total number of household members
Owner-occupier	Owner occupies the house: 1 if yes, 0 otherwise
Space per person	Area of the dwelling in sqm/divided by total number of persons occupying the dwelling
Car or motorcycle	Have a car or motorcycle: 1 if yes; 0 otherwise
Freezer	Have a freezer: 1 if yes; 0 otherwise
Automatic washing machine	Have an automatic washing machine : 1 if yes; 0 otherwise
Total number of leisure durables	Total number of leisure durables (colour TV, video recorder, parabolic antenna, stereo, radio, personal computer)
ln(total expenditures)	log total expenditures of food
ln(tobacco)	log expenditures of tobacco (cigarettes and tobacco)
ln(hygiene)	log expenditures of hygiene products and service and personal products (toilet soap, luxury toilet soap, shampoo, conditioner, shampoo and conditioner, hand cream, hydrating lotion, face cream, cleansing cream, deodorant, tooth paste, hair cut, hygienic services, purchased wash soaps, value of made soaps, washing powder, bleach, dishwashing soap, other washers, other cleaners, child care - baby sitting)
ln(energy)	log expenditures of energy (district heating, electricity, gas, coal, oil, wood, other energy sources)
ln(transport and communication)	log expenditures of transport and communication (gas and

	oil, car service, maintenance, taxi, tram and buses, trains - outside city, mail service, telephone)
ln(recreation)	log expenditures of recreation (cultural activities, books, newspapers, stationery, membership fees, pet food and expenses)
ln(housing)	log expenditures of housing (water and rent)
ln(clothes and shoes)	log expenditures of clothes and shoes (textile, clothes and shoes)
ln(furniture)	log expenditures of furniture (kitchen equipment, home repairs, furniture, bedding, sheets, others)
ln(health)	log expenditures of health (dentist, doctor, hospital/sanatorium, medicines, medications, optical equipment, cosmetics, others)
No tobacco	No expenditures of cigarettes and tobacco: 1 if no expenditures, 0 otherwise
No hygiene	No expenditures of hygiene and personal products: 1 if no expenditures, 0 otherwise
No energy	No expenditures of energy: 1 if no expenditures, 0 otherwise
No transport and communication	No expenditures of transport and communication: 1 if no expenditures, 0 otherwise
No recreation	No expenditures of recreation: 1 if no expenditures, 0 otherwise
No housing	No expenditures of housing: 1 if no expenditures, 0 otherwise
No clothes and shoes	No expenditures of clothes and shoes: 1 if no expenditures, 0 otherwise
No furniture	No expenditures of furniture: 1 if no expenditures, 0 otherwise
No health	No expenditures of health: 1 if no expenditures, 0 otherwise
Share bread	Share of expenditures of bread
Share starches	Share of expenditures of starches (maize flour, wheat flour, pasta, rice, beans, potatoes, carrots, lentils, sweet peas)
Share vegetables and fruits	Share of expenditures of vegetables and fruits (tomatoes, eggplants, onions, squash vegetables, leafy vegetables, peppers, cabbage, cucumbers, oranges, apples, pears, bananas, nuts, grapes, watermelon, melon, strawberries, cherries, canned fruits, and canned vegetables)
Share meat	Share of expenditures of meat (veal and beef, pork, lamb, chicken/fowl, sausages/salami, bacon, canned meat,

	ground meat)
Share fats and oils	Share of expenditures of fats and oils (butter, margarine, lard, olive oil, vegetable oil,)
Share dairy	Share of expenditures of dairy (fresh milk, white cheese, yellow cheese, yogurt, powder milk, eggs)
Share sweets	Share of expenditures of sweets (sugar, jam, honey)
ln(quantity)	log quantity (of each food)
Other foods	Fresh fish, frozen fish, canned fish, condiments and spices (salt, spices, coffee, tea, others), drinks (water, wine, beer, Bulgarian liquor, hard liquors, other drinks), prepared food (not at home)

TA2: Engel curves in 1995

Variable	1995													
	Bread		**Starches**		**Veg and fruits**		**Meat**		**Fats and oils**		**Dairy**		**Sweets**	
	Coef	Std-err	Coef	Std-err	Coef	Std-err	Coef	Std-err	Coef	Std-err	Coef	Std-err	Coef	Std-err
Mother language of head	-0.8129	0.6888	-0.9421	0.6116	-1.1374	1.0914	**2.6703**	1.1565	-0.2530	0.3650	0.0141	1.1021	0.4609	0.4428
Age of head	**0.2202**	0.0729	0.0423	0.0647	**-0.3158**	0.1156	**0.3170**	0.1224	-0.0030	0.0386	-0.0995	0.1167	**-0.1613**	0.0469
Age of head square/100	**-0.2404**	0.0665	-0.0470	0.0590	**0.3044**	0.1054	**-0.3003**	0.1117	-0.0021	0.0352	0.1498	0.1064	**0.1356**	0.0428
Sex of head	**1.4475**	0.5457	**-0.9885**	0.4845	**-2.7422**	0.8646	**5.3859**	0.9162	**-0.7036**	0.2892	-1.2657	0.8731	**-1.1333**	0.3508
Married head	-0.5807	0.5157	**0.9146**	0.4578	0.5774	0.8171	**-3.6929**	0.8658	0.3277	0.2733	**1.9603**	0.8251	0.4935	0.3315
Secondary and middle general education of head	-0.6820	0.5209	0.1169	0.4625	-0.0071	0.8253	-0.6909	0.8745	0.4047	0.2760	0.7520	0.8334	0.1063	0.3349
Technical and vocational education of head	-0.9710	0.6195	-0.4070	0.5500	0.5968	0.9816	-0.5632	1.0401	0.6225	0.3283	-0.0489	0.9912	0.7708	0.3983
University of head	**-1.4626**	0.7121	-0.7128	0.6323	-0.7560	1.1284	0.1049	1.1956	0.3539	0.3774	1.5780	1.1395	0.8946	0.4578
Urban	-0.6504	1.0322	-0.2597	0.9165	2.7398	1.6356	-1.1720	1.7330	-0.6580	0.5470	-0.5745	1.6516	0.5748	0.6636
Household size	**1.4546**	0.1541	**0.6035**	0.1368	**-0.9463**	0.2441	**-1.2695**	0.2587	**0.2273**	0.0816	0.0031	0.2465	-0.0726	0.0991
Owner-occupier	0.8970	0.7076	-0.8807	0.6282	2.1663	1.1212	-1.8054	1.1880	-0.2417	0.3750	0.0568	1.1322	-0.1924	0.4549
Space per person	**-0.0134**	0.0064	-0.0104	0.0057	0.0085	0.0101	0.0190	0.0107	-0.0064	0.0034	0.0001	0.0102	0.0035	0.0041
Durable ownership														
Car or motorcycle	-0.6087	0.3945	-0.4380	0.3502	0.0039	0.6251	0.1826	0.6623	0.3546	0.2091	-0.3167	0.6312	**0.8223**	0.2536
Freezer	-0.3725	0.4584	**-0.9789**	0.4070	1.2948	0.7264	0.8456	0.7697	0.2479	0.2429	-0.5404	0.7335	-0.4965	0.2947
Automatic washing machine	-0.6643	0.3894	-0.4542	0.3457	-0.6134	0.6170	0.5675	0.6537	0.2595	0.2064	0.4148	0.6230	**0.4901**	0.2503
Total number of leisure durables	-0.1159	0.1587	0.0827	0.1409	0.0347	0.2515	0.0984	0.2665	**-0.2355**	0.0841	-0.1953	0.254	**0.3309**	0.1021

Conditioning expenditures														
ln(tobacco)	0.0252	0.1744	0.0466	0.1549	-0.2037	0.2764	-0.1364	0.2929	-0.1747	0.9245	0.2790	0.2791	0.1640	0.1122
ln(hygiene)	**-0.8499**	0.2203	**-0.5857**	0.1956	0.6446	0.3491	0.3741	0.3699	-0.1880	0.1168	0.3154	0.3526	**0.2894**	0.1417
ln(energy)	**0.4310**	0.2032	0.1311	0.1804	-0.3310	0.3220	-0.0353	0.3412	-0.0040	0.1077	-0.0632	0.3252	-0.1286	0.1307
ln(transport and communication)	**0.3206**	0.1369	0.0147	0.1216	0.2834	0.2169	-0.4339	0.2299	**0.1627**	0.0726	-0.1074	0.2191	**-0.2401**	0.0880
ln(recreation)	0.0768	0.1632	-0.0680	0.1449	-0.4114	0.0026	-0.0089	0.2740	**0.2009**	0.0865	0.3407	0.2611	-0.1301	0.1049
ln(housing)	0.1286	0.2194	**0.5709**	0.1948	**-0.7834**	0.3476	0.3078	0.3683	-0.0105	0.1163	-0.0034	0.3510	**-0.2101**	0.1410
ln(cloths and shoes)	0.1023	0.1430	-0.0174	0.1270	0.1446	0.2266	0.0236	0.2401	-0.4922	0.0758	-0.2878	0.2288	0.0838	0.0919
ln(furniture)	-0.1401	0.1675	0.1697	0.1488	-0.2254	0.2655	0.0826	0.2813	0.0695	0.0888	-0.0298	0.2681	0.0735	0.1077
ln(health)	-0.0312	0.1133	0.1256	0.1006	**0.5709**	0.1796	**-0.6969**	0.1903	0.0728	0.0601	-0.0123	0.1813	-0.0289	0.0729
No tobacco	-0.2124	0.3367	-0.4090	0.2990	0.0598	0.5336	-0.4524	0.5654	-0.1560	0.1785	**1.2513**	0.5388	-0.0811	0.2165
No hygiene	-2.4900	1.4152	0.5766	1.2565	0.9599	2.2423	1.3192	2.3760	-0.0220	0.750	-0.6354	2.2644	0.2917	0.9098
No energy	1.6181	1.8039	-0.0044	1.6016	0.1498	2.8583	-1.0922	3.0286	0.8328	0.9560	-1.4365	2.8864	-0.0676	1.1598
No transport and communication	0.3463	0.4601	**-1.1879**	0.4085	-0.2964	0.7290	**2.1901**	0.7725	-0.3229	0.2438	-0.5016	0.7362	-0.2276	0.2958
No recreation	0.3941	0.4230	**0.7644**	0.3755	-0.2973	0.6702	0.5219	0.7101	**-0.5081**	0.2241	-0.8224	0.6768	-0.0527	0.2719
No housing	-1.6761	1.0942	-0.5245	0.9715	0.6924	1.7338	0.1450	1.8371	-0.1709	0.5799	2.2590	1.7508	-0.7248	0.7035
No clothes and shoes	0.2473	0.4227	-0.6506	0.3753	0.1754	0.6698	1.2717	0.7097	**0.5598**	0.2240	-1.0504	0.6764	**-0.5532**	0.2718
No furniture	0.0341	0.4203	-0.5491	0.3731	**1.5575**	0.6659	0.2687	0.7056	-0.2235	0.2227	0.1038	0.6724	**-1.1914**	0.2702
No health	-0.1248	0.3988	-0.4427	0.3541	**-2.0987**	0.6319	**3.1748**	0.6696	-0.3627	0.2114	-0.0478	0.6382	-0.0982	0.2564

ln(total expenditures)	**-4.3734**	0.4777	**-3.2203**	0.4241	**3.3302**	0.7569	**8.0066**	0.8020	**-1.635**	0.2531	**-2.4024**	0.7643	0.2944	0.3071
R-square	14.03		12.42		5.34		15.24		6.09		5.69		13.02	

Notes: All coefficients , standard errors and R-square are multiplied by 100. Bold entries correspond to 5% or 1% significance level.

Table TA3: Engel curves in 1997

Variable	1997													
	Bread		**Starches**		**Veg andfruits**		**Meat**		**Fats and oils**		**Dairy**		**Sweets**	
	Coef	Std-err	Coef	Std-err	Coef	Std-err	Coef	Std-err	Coef	Std-err	Coef	Std-err	Coef	Std-err
Household characteristics														
Mother language of head	**-4.6101**	1.2719	-1.9813	1.0313	1.2884	1.4917	2.5498	1.6358	0.1915	0.4301	2.4386	1.3125	0.1231	0.6404
Age of head	**0.2787**	0.1407	0.1198	0.1141	-0.1644	0.1650	-0.0945	0.1809	0.0862	0.0476	-0.1217	0.1452	-0.1041	0.0708
Age of head square/100	**-0.2771**	0.1281	-0.0684	0.1039	0.0842	0.1503	0.0890	0.1648	**-0.0923**	0.0433	0.1741	0.1322	0.0905	0.0645
Sex of head	-0.4381	1.0773	-0.0815	0.8735	-0.6962	1.2634	**4.3208**	1.3855	-0.5931	0.3643	-2.0337	1.1112	-0.4781	0.5424
Married head	1.9934	1.0403	1.0223	0.8435	-0.0061	1.2200	**-4.6244**	1.3379	0.5601	0.3518	1.8322	1.0735	-0.7775	0.5238
Secondary and middle general education of head	1.2477	1.0858	**-4.6528**	0.8804	0.0696	1.2734	-0.8042	1.3964	-0.0941	0.3672	**3.4416**	1.1205	0.7921	0.5467
Technical and vocational education of head	-0.0172	1.2575	**-4.6568**	1.0197	0.4527	1.4748	-1.5984	1.6173	0.1158	0.4253	**4.5504**	1.2977	1.1535	0.6332
University of head	0.4667	1.4396	**-4.3629**	1.1674	-0.0614	1.6884	-0.2445	1.8515	-0.4797	0.4869	**2.9415**	1.4856	**1.7402**	0.7249
Urban	2.8241	1.6674	-1.9841	1.3521	2.4098	1.9556	-3.8818	2.1445	0.7005	0.5639	-1.9867	1.7207	**1.9180**	0.8396
Household size	**3.1712**	0.2769	**0.5876**	0.2245	**-1.4576**	0.3247	**-2.5618**	0.3561	0.0822	0.0936	0.1651	0.2857	0.0133	0.1394
Owner-occupier	1.5991	1.4027	-0.8105	1.1374	1.9135	1.6451	**-4.2200**	1.8041	0.6089	0.4744	1.3769	1.4475	-0.4680	0.7063
Space per person	-0.0228	0.0143	-0.0145	0.0116	0.0148	0.0167	0.0167	0.0183	0.0005	0.0048	0.0051	0.0147	0.0001	0.0072

Durable ownership														
Car or motorcycle	0.4749	0.6991	-0.2182	0.5669	-0.8820	0.8200	-0.0832	0.8992	-0.0333	0.2364	0.5086	0.7215	0.2333	0.3520
Freezer	-0.6076	0.6949	-0.0257	0.5635	**-1.4160**	0.8150	1.0387	0.8937	0.0801	0.2350	0.4499	0.7171	0.4806	0.3499
Automatic washing machine	**-2.0559**	0.7011	0.6427	0.5685	0.3796	0.8223	0.3275	0.9017	0.0848	0.2371	0.1797	0.7235	0.4416	0.3530
Total number of leisure durables	-0.0934	0.2746	0.0026	0.2227	-0.078	0.3221	0.1935	0.3532	-0.0941	0.0929	0.0662	0.2834	0.0033	0.1383
Conditioning expenditures														
ln(tobacco)	**0.6752**	0.3071	0.0608	0.2490	0.3428	0.3602	0.2419	0.3950	-0.1595	0.1039	**-0.9281**	0.3169	-0.2332	0.1546
ln(hygiene)	0.0407	0.3626	0.4550	0.294	0.0201	0.4252	**-0.9559**	0.4663	0.0121	0.1226	0.2716	0.3741	0.1563	0.1826
ln(energy)	-0.1016	0.3326	0.0650	0.2697	**-0.8681**	0.3901	0.4310	0.4278	0.0391	0.1125	0.4099	0.3433	0.0246	0.1675
ln(transport and communication)	0.3234	0.2410	-0.0291	0.1955	-0.0068	0.2827	-0.1075	0.3100	-0.0178	0.0815	-0.2695	0.2487	0.1074	0.1214
ln(recreation)	0.2404	0.2781	-0.3636	0.2255	-0.0748	0.3261	0.1108	0.3577	-0.0818	0.0940	0.3111	0.2870	-0.1421	0.1400
ln(housing)	-0.1655	0.3038	-0.1801	0.2463	**0.9526**	0.3563	0.0165	0.3907	0.1447	0.1027	-0.5401	0.3135	-0.2280	0.1530
ln(clothes and shoes)	-0.1984	0.2615	-0.2181	0.2120	0.0365	0.3067	0.1417	0.3363	0.0471	0.0884	0.3426	0.2699	-0.1514	0.1317
ln(furniture)	0.3296	0.4402	-0.2143	0.3570	-0.8655	0.5163	0.8148	0.5662	0.0177	0.1489	-0.3687	0.4543	0.2864	0.2217
ln(health)	-0.1908	0.2061	-0.0142	0.1671	**0.5106**	0.2417	-0.3280	0.2650	-0.0250	0.0697	0.0372	0.2127	0.0103	0.1038
No tobacco	**-2.1521**	0.6298	0.5853	0.5107	0.7053	0.7386	1.1138	0.8099	-0.3097	0.2130	-0.0787	0.6499	0.1360	0.3171
No hygiene	-2.277	1.7057	-0.295	1.3831	-3.268	2.0000	3.530	2.1937	-0.268	0.5769	2.0128	1.7602	0.5681	0.8589

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No energy	-5.3098	3.1614	0.3676	2.5635	-0.0703	3.7077	1.8079	4.0659	-0.8375	1.0692	2.3429	3.2624	1.6991	1.5919
No transport and communication	-1.0418	0.9383	-0.8016	0.7608	-0.2373	1.1004	-0.5227	1.2067	0.2247	0.3173	1.8793	0.9683	0.4993	0.4725
No recreation	0.0206	0.7656	0.0223	0.6208	-1.2466	0.8979	1.3793	0.9846	-0.0714	0.2589	0.0707	0.7900	-0.1749	0.3855
No housing	0.6071	1.5480	-0.0200	1.2552	-1.1050	1.8155	-1.0763	1.9909	0.8259	0.5235	2.1019	1.5975	-1.3336	0.7795
No clothes and shoes	-0.3164	0.7536	0.8588	0.6110	1.1653	0.8838	0.1514	0.9692	-0.2546	0.2548	-1.4573	0.7776	-0.1472	0.3794
No furniture	-1.2202	1.3140	1.1371	1.0655	**4.1874**	1.5411	-1.7827	1.690	-0.1190	0.4444	-1.4607	1.3560	-0.7419	0.6616
No health	0.4771	0.7468	-0.7124	0.6056	**-1.5171**	0.8759	1.0102	0.9605	**0.5793**	0.2526	0.7843	0.7707	-0.6215	0.3761
ln(total expenditures)	**-12.505**	0.8206	**-3.0969**	0.6654	**4.8016**	0.9624	**13.301**	1.0554	**-0.7675**	0.2775	**-2.3120**	0.8468	0.5795	0.4132
R-square	29.70		10.72		6.75		21.86		4.56		7.01		7.52	

Notes: All coefficients, standard errors and R-square are multiplied by 100. Bold entries correspond to 5% or 1% significance level.

Table TA4: Engel curves in 2001

Variable	2001													
	Bread		**Starches**		**Veg and fruits**		**Meat**		**Fats and oils**		**Dairy**		**Sweets**	
	Coef	Std-err	Coef	Std-err	Coef	Std-err	Coef	Std-err	Coef	Std-err	Coef	Std-err	Coef	Std-err
Household characteristics														
Mother language of head	-0.1651	0.7589	**-2.2815**	0.6403	0.0296	0.9305	1.0957	1.1303	-0.2197	0.2925	1.3261	0.9292	0.2148	0.4826
Age of head	**0.3211**	0.0778	0.0571	0.0657	-0.0809	0.0954	0.0554	0.1159	-0.0265	0.03	-0.1324	0.0953	**-0.1939**	0.0495
Age of head square/100	**-0.2850**	0.0721	-0.0950	0.0608	0.0753	0.0884	-0.0500	0.1073	0.0289	0.0278	0.1561	0.0882	**0.1698**	0.0458
Sex of head	0.5344	0.5826	0.3083	0.4916	-0.3395	0.7144	0.4479	0.8677	-0.1690	0.2246	-1.0417	0.7134	0.2595	0.3705
Married head	-0.7994	0.5696	-0.7473	0.4806	0.1362	0.6984	-0.4640	0.8483	-0.0221	0.2196	**2.0809**	0.6974	-0.1842	0.3622
Secondary and middle general education of head	-0.3251	0.7187	-0.9778	0.6064	-0.162	0.8813	1.0489	1.0705	**0.5749**	0.2771	0.3105	0.8801	-0.4694	0.4571
Technical and vocational education of head	0.0157	0.7937	**-1.3830**	0.6696	-0.2579	0.9732	1.8285	1.1821	0.5135	0.3059	-0.1571	0.9718	-0.5598	0.5048
University of head	-0.6410	0.9096	-1.0536	0.7675	0.0466	1.1154	1.1798	1.3547	0.4974	0.3506	0.5498	1.1138	-0.5791	0.5785
Urban	**-3.5872**	0.7338	**-1.6679**	0.6192	**2.2535**	0.8998	**2.5417**	1.0930	**-0.8233**	0.2829	0.9922	0.8985	0.2909	0.4667
Household size	**2.3993**	0.1826	**1.0152**	0.1541	**-1.3874**	0.2240	**-1.8905**	0.2720	**0.3169**	0.0704	-0.1286	0.2236	**-0.3249**	0.1162
Owner-occupier	-0.2855	0.6701	**1.2252**	0.5654	-0.9235	0.8217	0.6419	0.9981	-0.0162	0.2583	-0.5985	0.8206	-0.0434	0.4262
Space per person	-0.0099	0.0099	0.0009	0.0083	0.0056	0.0121	-0.0067	0.0147	**-0.0088**	0.0038	0.0037	0.0121	**0.0152**	0.0063

Durable ownership														
Car or motorcycle	-0.2004	0.4403	-0.5621	0.3715	0.5281	0.5398	0.8948	0.6557	-0.2714	0.1697	-0.4626	0.5391	0.0736	0.28
Freezer	-0.1595	0.4315	-0.2496	0.3641	-0.3083	0.5291	0.0541	0.6426	-0.1961	0.1663	0.9163	0.5283	-0.0569	0.2744
Automatic washing machine	-0.3199	0.4425	-0.4682	0.3734	-0.6455	0.5426	-0.3437	0.6591	-0.021	0.1706	**1.6218**	0.5419	0.1765	0.2814
Total number of leisure durables	**-0.4369**	0.1774	**-0.4591**	0.1497	0.1470	0.2176	0.4985	0.2643	0.0859	0.0684	-0.0567	0.2173	**0.2214**	0.1129
Conditioning expenditures														
ln(tobacco)	**0.7328**	0.1994	0.0813	0.1682	-0.3376	0.2445	-0.3857	0.2970	-0.0448	0.0769	-0.3106	0.2442	**0.2645**	0.1268
ln(hygiene)	-0.2799	0.2395	-0.2746	0.2020	0.3544	0.2936	-0.1147	0.3567	0.1101	0.0923	-0.0633	0.2932	0.2680	0.1523
ln(energy)	0.8145	0.2316	0.2603	0.1954	-0.2328	0.2840	-0.2918	0.3449	**-0.2110**	0.0893	0.0941	0.2836	**-0.4333**	0.1473
ln(transport and communication)	**0.5295**	0.1901	-0.0424	0.1604	-0.1957	0.2331	-0.3578	0.2831	**0.1510**	0.0733	-0.2529	0.2327	0.1683	0.1209
ln(recreation)	**-0.5555**	0.1886	-0.2526	0.1591	0.1714	0.2312	**0.7448**	0.2808	-0.0905	0.0727	0.2251	0.2309	**-0.2427**	0.1199
ln(housing)	**-0.5536**	0.2127	-0.0339	0.1795	0.2393	0.2608	0.2528	0.3168	0.0936	0.0820	0.1658	0.2604	**-0.1641**	0.1353
ln(clothes and shoes)	-0.2064	0.1862	0.1745	0.1571	0.0116	0.2283	0.0538	0.2773	-0.1138	0.0718	0.0566	0.228	0.0238	0.1184
ln(furniture)	-0.0691	0.2762	-0.0143	0.2330	-0.1393	0.3387	-0.1414	0.4114	0.0611	0.1065	0.4288	0.3382	-0.1258	0.1757
ln(health)	**0.3576**	0.1338	**0.3310**	0.1129	-0.3001	0.1640	-0.3873	0.1992	**0.1033**	0.0516	-0.0830	0.1638	-0.0214	0.0851
No tobacco	**-0.7830**	0.3977	**-0.7850**	0.3355	0.4865	0.4876	-1.0510	0.5923	-0.0557	0.1533	**2.2250**	0.4869	-0.0368	0.2529
No hygiene	-0.402	2.7465	0.5657	2.3173	-5.527	3.3678	-0.071	4.0906	-1.626	1.0587	**6.9945**	3.3630	0.0680	1.7468

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No energy	0.4386	1.0823	-1.4598	0.9132	0.3558	1.3271	1.9097	1.6120	0.2773	0.4172	-0.6750	1.3253	-0.8465	0.6883
No transport and communication	0.3201	0.6966	-0.8391	0.5878	-0.4003	0.8542	0.6767	1.0375	-0.2218	0.2685	0.1393	0.8530	0.3250	0.4430
No recreation	0.3578	0.4575	0.5308	0.3860	-0.7492	0.5609	-0.0002	0.6813	0.1460	0.1763	0.1845	0.5601	-0.4697	0.2909
No housing	0.1342	0.8211	**1.6579**	0.6928	-0.477	1.0068	-0.8708	1.2229	**-0.7557**	0.3165	-0.0243	1.0054	0.3356	0.5222
No clothes and shoes	0.4151	0.4931	0.0212	0.4160	0.5909	0.6046	0.3984	0.7344	0.0277	0.1901	**-1.2760**	0.6037	-0.1772	0.3136
No furniture	0.0607	0.5790	0.5601	0.4885	0.4140	0.7099	0.5946	0.8623	-0.1514	0.2232	-0.7084	0.7089	**-0.7696**	0.3682
No health	0.4545	0.4992	**-1.3411**	0.4212	0.1076	0.6121	1.2016	0.7434	-0.2755	0.1924	-0.1008	0.6112	-0.0464	0.3175
ln(total expenditures)	**-6.5945**	0.5423	**-3.2044**	0.4576	**3.8576**	0.6650	**7.5393**	0.8077	**-1.5564**	0.2091	**-1.6208**	0.6641	**1.5791**	0.3449
R-square	26.29		15.43		6.33		15.07		9.93		5.91		10.55	

Notes: All coefficients, standard errors and R-square are multiplied by 100. Bold entries correspond to 5% or 1% significance level.

Table TA5: Unit values equations in 1995

Variable	1995													
	Bread		**Starches**		**Veg and fruits**		**Meat**		**Fats and oils**		**Dairy**		**Sweets**	
	Coef	Std-err	Coef	Std-err	Coef	Std-err	Coef	Std-err	Coef	Std-err	Coef	Std-err	Coef	Std-err
Household characteristics														
Mother language of head	1.4869	3.0723	0.4806	2.9498	-0.2679	3.9516	-1.3195	3.1509	**-6.5028**	2.7287	4.8653	5.2929	2.2377	4.5496
Age of head	0.2006	0.3314	0.3966	0.3166	-0.6381	0.4227	0.4634	0.3363	0.2226	0.2920	0.924	0.5672	**-1.0666**	0.4864
Age of head square/100	-0.2440	0.3009	-0.3816	0.2875	0.6136	0.3837	-0.4372	0.3057	-0.2589	0.2650	-0.8855	0.5150	**1.0175**	0.4415
Sex of head	4.2271	2.4333	2.2914	2.3370	-1.4335	3.1221	**7.5215**	2.4921	-2.4624	2.1566	4.4175	4.1927	-6.5715	3.5912
Married head	**-4.9073**	2.3330	-0.8477	2.2535	0.1950	2.9934	-3.8292	2.3673	-0.5366	2.0722	3.8657	4.0260	**11.233**	3.4341
Secondary and middle general education of head	0.6186	2.3369	1.0042	2.2429	0.7176	3.0000	-2.5266	2.3814	**4.3063**	2.0712	-0.6620	4.030	-0.2346	3.4564
Technical and vocational education of head	3.3857	2.7789	-1.8287	2.6610	2.7931	3.5605	0.8186	2.8253	**5.5536**	2.4583	1.9213	4.7738	5.7571	4.1051
University of head	2.3519	3.2043	-4.6809	3.0598	0.2645	4.0941	5.0203	3.2498	**9.9235**	2.8246	**10.845**	5.4941	**15.960**	4.7141
Urban	6.4554	4.7022	-1.1388	4.5131	6.6775	6.0358	-2.6055	4.7938	**-15.712**	4.1671	11.170	8.1041	**-21.563**	6.9530
Household size	-0.4174	0.6784	1.1879	0.6174	1.0061	0.7959	1.0906	0.6347	**1.3474**	0.5655	**4.6817**	1.0600	**4.1568**	0.9172
Owner-occupier	3.8696	3.1472	-0.5569	3.0204	1.6501	4.0410	-2.8994	3.2080	-3.1236	2.7888	-4.5110	5.4212	-4.0851	4.6476
Space per person	-0.0257	0.0290	0.0001	0.0278	0.0331	0.0372	**0.0870**	0.0295	-0.0209	0.0257	0.0253	0.050	**0.1072**	0.0428

Durable ownership														
Car or motorcycle	0.6138	1.6740	-1.7612	1.6071	0.9785	2.1532	0.3272	1.7094	**3.4505**	1.4866	0.5207	2.8842	**1.7498**	2.4860
Freezer	-0.9486	2.0681	0.6301	1.9857	5.0720	2.6689	2.8037	2.1181	1.6817	1.8357	4.0780	3.568	-0.6970	3.0588
Automatic washing machine	-1.1921	1.7604	-0.6517	1.6884	2.4500	2.2579	1.0464	1.7959	2.6104	1.5599	2.2595	3.0295	**5.7578**	2.6063
Total number of leisure durables	0.2394	0.6888	**2.5650**	0.6615	**3.4621**	0.8895	**2.1318**	0.7081	0.4685	0.6105	**4.3729**	1.1859	**2.0754**	1.0328
ln(Quantity)	1.4779	1.3697	**-9.7208**	1.2075	**-2.9061**	1.3538	0.6557	1.0625	**-4.1848**	1.1778	**-32.030**	1.7208	**-22.285**	1.1371
R-square	1.91		4.29		2.34		3.85		4.53		16.99		19.16	

Notes: All coefficients, standard errors and R-square are multiplied by 100. Bold entries correspond to 5% or 1% significance level.

Table TA6: Unit values equations in 1997

Variable	1997													
	Bread		**Starches**		**Veg and fruits**		**Meat**		**Fats and oils**		**Dairy**		**Sweets**	
	Coef	Std-err	Coef	Std-err	Coef	Std-err	Coef	Std-err	Coef	Std-err	Coef	Std-err	Coef	Std-err
Household characteristics														
Mother language of head	-6.2981	3.2686	-9.178	5.1050	-14.613	10.256	-4.3360	5.8849	-3.8083	6.0273	4.9125	6.3476	-4.4921	7.6174
Age of head	-0.6469	0.3667	1.0262	0.5682	0.4061	1.1364	1.0020	0.6529	-0.8973	0.6746	0.6708	0.7045	1.3574	0.8456
Age of head square/100	0.4339	0.3334	-0.8904	0.5160	-1.0159	1.0325	-0.9124	0.5935	0.3298	0.6128	-0.6963	0.6402	-1.2888	0.7683
Sex of head	-3.2237	2.7392	-1.3835	4.2760	8.0367	8.5607	4.3689	4.9414	-1.7720	5.0482	0.9199	5.3074	11.690	6.3827
Married head	4.4192	2.6488	1.1000	4.1554	-2.3985	8.2914	-5.1009	4.7518	-3.4663	4.9173	9.6878	5.1384	**-16.418**	6.1760
Secondary and middle general education of head	3.9563	2.7722	0.3573	4.3584	4.476	8.6652	6.0664	4.9772	9.5057	5.1116	**13.292**	5.3735	7.3086	6.4542
Technical and vocational education of head	0.2632	3.1932	0.5402	5.0076	5.2415	9.9987	11.133	5.7373	**16.177**	5.8906	**19.186**	6.2025	**18.605**	7.4392
University of head	3.0914	3.6566	0.3580	5.7275	-3.6772	11.453	5.9423	6.5739	4.4659	6.7444	12.122	7.0988	12.857	8.5338
Urban	5.9672	4.3092	-1.1796	6.7418	-1.2409	13.470	**-15.208**	7.7484	-10.451	7.9659	-8.1000	8.4200	**25.004**	10.025
Household size	**2.0866**	0.7416	1.9420	1.0830	-0.9899	2.0734	-1.5170	1.1925	**5.0842**	1.2356	2.4007	1.3088	**5.4562**	1.5474
Owner-occupier	4.7295	3.6362	-5.7606	5.6784	-14.051	11.373	**-19.717**	6.5306	10.146	6.7052	5.1833	7.0507	**-20.873**	8.4656

Space per person	0.0413	0.0370	0.0167	0.0578	0.2178	0.1157	-0.0013	0.0664	0.0796	0.0682	0.0994	0.0717	0.1399	0.0862
Durable ownership														
Car or motorcycle	-0.4986	1.7481	-1.9506	2.7310	-4.3910	5.4715	1.6704	3.1435	-4.4555	3.2269	3.4952	3.3902	-5.1980	4.0949
Freezer	3.3301	1.8021	2.8838	2.8213	2.4831	5.6442	0.4749	3.2654	4.2222	3.3318	**7.6435**	3.5005	0.5053	4.2177
Automatic washing machine	-3.1418	1.8210	0.1157	2.8409	4.2545	5.6885	-1.0140	3.2703	1.8040	3.3644	2.2038	3.5267	**8.7059**	4.2339
Total number of leisure durables	0.2094	0.6865	0.1616	1.0767	**4.4024**	2.1655	**3.0156**	1.2507	**3.1618**	1.2666	**3.8748**	1.3364	0.8080	1.6191
ln(Quantity)	**-6.9119**	1.5837	**-13.801**	1.9770	**-18.913**	2.9778	0.7808	1.6788	**-6.4881**	2.4030	**-35.239**	1.7766	**-23.043**	1.9056
R-square	4.36		5.16		6.21		2.54		8.93		28.00		15.70	

Notes: All coefficients, standard errors and R-square are multiplied by 100. Bold entries correspond to 5% or 1% significance level.

Table TA7: Unit values equations in 2001

Variable	2001													
	Bread		**Starches**		**Veg and fruits**		**Meat**		**Fats and oils**		**Dairy**		**Sweets**	
	Coef	Std-err	Coef	Std-err	Coef	Std-err	Coef	Std-err	Coef	Std-err	Coef	Std-err	Coef	Std-err
Household characteristics														
Mother language of head	2.0147	2.4031	-0.9740	3.0316	5.0072	5.3094	-1.4689	3.8616	-0.9565	2.4536	6.6875	4.3406	0.2578	4.8593
Age of head	0.2336	0.2509	0.4861	0.3146	**-1.3481**	0.5512	**0.9358**	0.3993	-0.2281	0.2551	-0.1615	0.4500	-0.4294	0.5028
Age of head square/100	-0.1856	0.2309	-0.5537	0.2899	0.9398	0.5079	**-0.8690**	0.3680	0.2633	0.2350	-0.0763	0.4145	0.4259	0.4631
Sex of head	2.5102	1.8535	4.0611	2.3333	6.9269	4.0843	2.3856	2.9672	-0.6669	1.8906	1.4876	3.3380	**-7.3569**	3.7422
Married head	**-3.9829**	1.8155	**-5.2533**	2.2944	-3.8285	4.0197	4.5313	2.9054	0.3592	1.8564	2.5165	3.2947	**9.4739**	3.6576
Secondary and middle general education of head	-3.6978	2.3083	-1.9741	2.9040	-1.0314	5.0853	1.7357	3.6873	4.0504	2.3549	2.4364	4.1551	-3.3241	4.6426
Technical and vocational education of head	-1.6650	2.5320	-2.5603	3.1910	-1.9999	5.5858	2.3752	4.0522	4.3775	2.5863	1.0954	4.5638	-4.9130	5.0996
University of head	-1.1304	2.8986	-0.7753	3.6542	5.4629	6.4015	**11.553**	4.6396	**11.376**	2.9596	5.9601	5.2304	8.1620	5.8408
Urban	-2.9884	2.3547	4.6099	2.9565	**23.499**	5.1627	**10.554**	3.7456	-2.6495	2.3903	**21.997**	4.2296	-4.9277	4.7152
Household size	0.6813	0.5829	**2.4230**	0.6992	-0.6055	1.1606	-1.5609	0.8491	0.6759	0.5705	**3.0561**	0.9526	-0.1986	1.0642
Owner-occupier	-0.463	2.1035	4.4648	2.6507	-3.012	4.6401	-3.715	3.3646	-3.898	2.1474	-2.439	3.7916	**11.049**	4.2398

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Space per person	-0.0051	0.0316	0.0311	0.0397	0.0182	0.0695	0.0763	0.0504	-0.0019	0.0322	0.0381	0.0568	0.0153	0.0635
Durable ownership														
Car or motorcycle	-0.0772	1.3639	1.6675	1.7189	**7.0696**	3.0171	**5.1438**	2.1882	-0.1487	1.3926	4.1523	2.4597	**5.6874**	2.7583
Freezer	0.8059	1.3836	-1.0797	1.7442	-1.1158	3.0620	-3.4862	2.2228	-2.2025	1.4135	**5.0052**	2.4979	0.2339	2.7915
Automatic washing machine	2.0505	1.4143	0.5373	1.7822	2.5445	3.1228	2.4890	2.2658	2.4117	1.444	**8.3276**	2.5568	3.1909	2.8609
Total number of leisure durables	0.3096	0.5465	-0.3970	0.6892	**3.2061**	1.2232	**2.2935**	0.8892	**2.9423**	0.5588	**2.5342**	0.9904	**2.8945**	1.1151
ln(Quantity)	**-3.0175**	1.1208	**-7.5268**	1.3981	**-3.9477**	1.8453	-0.8106	1.3129	0.3979	1.220	**-29.866**	1.4406	**-11.213**	1.2311
R-square	1.42		2.89		4.56		4.25		4.29		22.45		6.89	

Notes: All coefficients, standard errors and R-square are multiplied by 100. Bold entries correspond to 5% or 1% significance level.

TA8: Marshallian income elasticities of demand by 1995 percentiles of per adult expenditures

1995			
	<= 10th pa expenditure	25-50th pa expenditure	>90th pa expenditure
Bread	**0.7049*** (0.0322)**	**0.5745*** (0.0465)**	**0.2119** (0.0861)**
Starches	**0.7847*** (0.0283)**	**0.7397*** (0.0343)**	**0.6008*** (0.0526)**
Meat	**1.3907** (0.0391)**	**1.1505*** (0.0342)**	**1.2534*** (0.0254)**
1997			
	<= 10th pa expenditure	25-50th pa expenditure	>90th pa expenditure
Bread	**0.5197*** (0.0315)**	**0.2039*** (0.0522)**	**-0.6298*** (0.1069)**
Starches	**0.7777*** (0.0477)**	**0.7138*** (0.0615)**	**0.5875*** (0.0886)**
Meat	**1.6973*** (0.0533)**	**1.4784*** (0.0380)**	**1.3273*** (0.0260)**
2001			
	<= 10th pa expenditure	25-50th pa expenditure	>90th pa expenditure
Bread	**0.7029*** (0.0244)**	**0.5778*** (0.0365)**	**0.4060*** (0.0488)**
Starches	**0.7997*** (0.0286)**	**0.7443*** (0.0365)**	**0.7156*** (0.0406)**
Meat	**1.4164*** (0.0446)**	**1.3230*** (0.0346)**	**1.2657*** (0.0285)**

Notes: Standard errors are in brackets. Bold entries correspond to rejection of H0:e=1.

Significance level: *(10%),**(5%) and ***(1%).

TA9: Marshallian price elasticities of demand by 1995 percentiles of per adult expenditures

1995									
	<= 10th pa expenditure			25-50th pa expenditure			>90th pa expenditure		
	Bread	Starches	Meat	Bread	Starches	Meat	Bread	Starches	Meat
Bread	-0.302*** (0.0809)	0.2609*** (0.0473)	0.0415 (0.0615)	-0.0132 (0.1165)	0.3651*** (0.0681)	0.0751 (0.0889)	0.7904*** (0.2157)	0.6423*** (0.1258)	0.1984 (0.1656)
Starches	0.2466*** (0.0468)	-0.171** (0.0707)	-0.20*** (0.0594)	0.2864*** (0.0564)	-0.0046 (0.0854)	-0.23*** (0.0719)	0.4202*** (0.0864)	0.5090*** (0.1309)	-0.32*** (0.1108)
Meat	-0.0716 (0.0446)	-0.23*** (0.0435)	-1.14 *** (0.0782)	-0.0459 (0.0378)	-0.192*** (0.0370)	-1.13*** (0.0667)	-0.0229 (0.0287)	-0.135*** (0.0280)	-1.12*** (0.0511)
1997									
Bread	-1.047*** (0.0866)	-0.18*** (0.0455)	0.2087*** (0.0701)	-1.161*** (0.1432)	-0.331*** (0.0754)	0.4154*** (0.1167)	-1.46*** (0.2927)	-0.733*** (0.1541)	1.060*** (0.2410)
Starches	-0.413*** (0.0856)	-0.32*** (0.1067)	0.1207* (0.0705)	-0.561*** (0.1095)	-0.1292 (0.1372)	0.1804** (0.0916)	-0.842*** (0.1574)	0.2416 (0.1977)	0.3130** (0.1347)
Meat	-0.0217 (0.0964)	-0.0399 (0.0517)	-3.517*** (0.1105)	0.0345 (0.0657)	-0.0125 (0.0353)	-2.769*** (0.0762)	0.0499 (0.0448)	0.0023 (0.0240)	-2.25*** (0.0527)
2001									
Bread	-1.412*** (0.0696)	-0.63*** (0.0480)	0.0770* (0.0399)	-1.612*** (0.0987)	-0.915*** (0.0681)	0.1315** (0.0570)	-1.889*** (0.1388)	-1.294*** (0.0958)	0.215*** (0.0806)
Starches	-0.900*** (0.0666)	-1.51*** (0.0874)	0.0681 (0.0472)	-1.166*** (0.0849)	-1.6619*** (0.1116)	0.1003 (0.0605)	-1.31*** (0.0943)	-1.740*** (0.1240)	0.1259* (0.0676)
Meat	-0.0640 (0.0497)	-0.0385 (0.0421)	-1.820*** (0.0480)	-0.0284 (0.0381)	-0.0186 (0.0325)	-1.653*** (0.0376)	-0.0113 (0.0312)	-0.0120 (0.0266)	-1.55*** (0.0312)

Notes: Standard errors are in brackets. Bold entries correspond to rejection of H0:e=0.
Significance level: *(10%), **(5%) and ***(1%).

TA10: Income elasticities of demand for nutrients by 1995 percentiles of per adult expenditures

1995			
	<= 10th pa expenditure	25-50th pa expenditure	>90th pa expenditure
Calories	**0.8432**	**0.8199**	**0.7461**
Protein	**0.9568**	**0.9369**	**0.8868**
Fat	**0.8336**	**0.8380**	**0.8084**
Carbohydrates	**0.8218**	**0.7943**	**0.6381**
1997			
	<= 10th pa expenditure	25-50th pa expenditure	>90th pa expenditure
Calories	**0.7885**	**0.6850**	**0.5399**
Protein	**0.8850**	**0.8040**	**0.7083**
Fat	**1.0516**	**1.0078**	**0.9579**
Carbohydrates	**0.6699**	**0.5140**	**0.2478**
2001			
	<= 10th pa expenditure	25-50th pa expenditure	>90th pa expenditure
Calories	**0.8889**	**0.8520**	**0.8121**
Protein	**0.9805**	**0.9494**	**0.9285**
Fat	**0.8831**	**0.8611**	**0.8310**
Carbohydrates	**0.8731**	**0.8159**	**0.7618**

TA11: Price elasticities of demand for nutrients by 1995 percentiles of per adult expenditures

1995									
	<= 10th pa expenditure			25-50th pa expenditure			>90th pa expenditure		
	Bread	Starches	Meat	Bread	Starches	Meat	Bread	Starches	Meat
Calories	0.0800	0.1538	-0.3116	0.1633	0.1823	-0.3249	0.3628	0.2869	-0.3857
Protein	-0.0941	0.0045	-0.3222	0.0155	0.0472	-0.3901	0.1853	0.1412	-0.4909
Fat	0.3415	0.2327	-0.5309	0.3312	0.2239	-0.5555	0.3746	0.2518	-0.6448
Carbohydrates	-0.0977	0.1235	-0.1174	0.0716	0.1875	-0.1131	0.4090	0.3697	-0.0958
1997									
Calories	-0.5909	-0.2193	-0.1921	-0.5847	-0.2301	-0.1226	-0.5864	-0.2339	-0.0394
Protein	-0.5584	-0.1954	-0.5397	-0.5246	-0.1892	-0.5143	-0.4911	-0.1683	-0.5107
Fat	-0.2715	-0.2270	-0.7499	-0.2461	-0.2216	-0.6527	-0.2459	-0.2268	-0.5593
Carbohydrates	-0.7120	-0.2229	0.1015	-0.7463	-0.2449	0.2153	-0.8116	-0.2582	0.4245
2001									
Calories	-0.9293	-0.6549	-0.1126	-0.9812	-0.7394	-0.1142	-1.0595	-0.8505	-0.1198
Protein	-0.7970	-0.6040	-0.4478	-0.7908	-0.6496	-0.4817	-0.7814	-0.6982	-0.5131
Fat	-0.8155	-0.4976	-0.2011	-0.8931	-0.5495	-0.2119	-1.0275	-0.6356	-0.2239
Carbohydrates	-1.0484	-0.7940	0.0544	-1.1069	-0.9170	0.0784	-1.1707	-1.0763	0.1065

Notes: Standard errors are in brackets. Bold entries correspond to rejection of H0:e=0

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