Coll. Antropol. **36** (2012) 4: 1143–1154
Original scientific paper

The Russian Food, Alcohol and Tobacco Consumption Patterns during Transition

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A B S T R A C T

The paper presents evidence on the impact of individual characteristics as well as regional macroeconomic factors on changes in fat, protein, alcohol and tobacco consumption, and on diet's diversity during the transition period 1994 – 2004 in Russia. The results from estimating first difference demand functions using Russian Longitudinal Monitoring Survey (RLMS) data suggest that individual characteristics such as initial consumption patterns, gender, education, household income, and access to a garden plot all have a significant impact on the consumption behaviour. Regarding the macroeconomic variables, inflation has a significant impact on alcohol and tobacco consumption, while unemployment significantly impacts only smoking behaviour. Russian consumers respond to own prices of fat and protein as well as to own prices of alcohol and tobacco but to a lesser extent. Analysis of subsamples based on different initial consumption patterns reveals significant heterogeneity in consumption responses.

***Key words**: food, alcohol, cigarette, consumption, transition, Russia*

Introduction

Political, economic and social reforms associated with the Russia transition since the collapse of central planning in the beginning of the 1990s have brought significant changes to citizens' lives. The consequent economic downturn led to the real GDP falling to 55% of its 1989 level by 1998, the lowest point over the last two decades, and a subsequent recovery to 88% by 2005[1]. Early transition has also been characterized by emerging open unemployment and exploding inflation. High inflation, sharp decline in production, and quite common wage arrears eroded the income generating basis for many households. Estimates of poverty at the beginning of the new century range between 15 and 22 percent[2,3]. Social indicators also point to a fall in living standards, deteriorating health conditions and rising mortality. One indicator of declining health conditions is the drop in life expectancy during transition. By 2005, life expectancy for Russian men was 59 years – a decline of about 5 years compared to 1989; and for Russian women the life expectancy was 72 years – a decline of 2 years[4].

Several studies have examined the reasons for the mortality crisis in Russia[5–9] during transition. The main and often intertwined factors leading to poor health and ultimately increased mortality in Russia are psychological stress and the unhealthy consumption patterns that include heavy alcohol (vodka) consumption, smoking and a high-fat diet (Walberg et al.[10] highlight also the role of accidents and crime for decreasing life expectancy in Russia). However, Field[11] and Shkolnikov et al.[12] provide evidence that premature mortality had been increasing already before the start of transition. Therefore, economic turmoil might not be the only reason and predetermined consumption patterns might also play an important role.

To gain a better understanding of the potential causes of poor health we focus on the consumption patterns of Russian population. Unhealthy consumption patterns include behaviours that are found to increase the probability of getting ill and have negative impact on health[13–16].

Received for publication August 15, 2012

This paper investigates how the changes in both socio-demographic and economic indicators affect the consumption behaviour described by diet, alcohol and tobacco consumption. More specifically, we estimate ten-year changes in demand functions for macronutrients (fat and protein), cigarettes, and alcohol as well as for diversity of diet using data from the Russian Longitudinal Monitoring Survey (RLMS), between 1994 and 2004. Furthermore, our analysis aims to quantify besides the impact of individual (and household) characteristics the importance of macro/regional economic conditions on consumption pattern changes. Thus, the primary contribution of the paper is the examination of the determinants of long-term changes in food, alcohol and tobacco consumption in a transition country. We also test if an individual's initial consumption patterns affect behavioural changes over the ten-year period, which is important for designing effective policies for improving the well-being of the Russian population.

The paper continues as follows. First, to guide our empirical analysis hypotheses are developed based on various theories of consumption and previous empirical results. Next, the data and econometric methodology are described, followed by a discussion of the estimation results. Finally, conclusions are offered.

Theory and Hypotheses

The standard microeconomic theory[17] models individual's i demand q_i as a function of income y_i, a vector of good's own price and prices of other relevant goods p and preferences θ_i evident in predetermined consumption patterns. To capture the impact of economic transition, a vector z is added representing changes in regional macroeconomic characteristics:

$$q_i = q(y_i, p, \theta_i, z) \quad (1)$$

where q_i represents demand for macronutrients (fat and protein), alcohol, tobacco (cigarettes) as well as demand for diet (food) diversity, which is a measure of the diet quality.

Income

Arnade and Gopinath[18] develop a theoretically consistent demand function for fat as an outcome of dynamic utility maximization where demand for fat is increasing in income. Similarly, demand for protein, tobacco and alcohol can be expected to increase in income. In the same time richer individuals (and households) may afford healthier diet, containing less fat as well as consume less alcohol and tobacco. However, the way household income is spent has attracted attention over the last two decades[19]. We assume representative consumer in the household and therefore in the econometric analysis total household income change is included as explanatory variable (together with the adult-equivalent number of household members). Because total household income may reveal more information about the financial situation of individuals we prefer it to an individual income measure. Specifications with individual income change show similar results and are reported in an Appendix available on request.

Prices

The standard microeconomic model establishes that demand for a good is negatively related to the good's price. Often it is assumed that in a cross-section prices do not vary across individuals. However, consumers situated in different communities or regions might well be affected by spatially non-uniform changes in food prices. Therefore, separate regional (relative) price indices for tobacco, alcohol, fat, and protein are included in the econometric specifications.

Preferences

Various studies suggest that preferences are revealed by predetermined consumption patterns. That is, cumulative past consumption creates a »stock« of habit that influences current consumption. Inclusion of past consumption represents a standard way to take preferences into account[20]. However, previous consumption might influence current demand in two different ways. If there is reduction in consumption due to accumulation (saturation) effect, the initial period level of consumption is expected to have a negative coefficient, smaller than –1 in our changes-on-changes specification. The formation of habits is linked to a coefficient on initial consumption, larger than –1 in the changes-on-changes specification. Such behavior is often exhibited by alcohol and tobacco consumption[21,22]. Given existing theory, the relationship between initial protein consumption and changes in protein consumption, as well as initial diversity of diet and its change is *a priori* unclear.

Individual and household characteristics are important identifiers of preferences. Thus, age and other individual characteristics such as gender and education are potentially important factors in the formation of consumption patterns. On the one hand, several empirical studies have shown that energy intake follows a life-cycle, generally increasing up to age of around 60 and declining subsequently[23]. On the other hand, older consumers might adjust more slowly because they have less time to benefit from moving to a new equilibrium in consumption. Better educated individuals may adjust faster to new economic conditions than those who are less educated[24,25]. Sedik and Wiesmann[26] using data from Russia show that larger households without access to garden plots suffer a higher level of food insecurity. Both household size and access to garden plot are thus important factors affecting consumption behavior under uncertain economic conditions. However, the magnitude of the effects on consumption patterns remains an empirical question.

Regional characteristics

Changes in regional macroeconomic conditions capture important features of transition. Furthermore, regional characteristics are assumed to affect consumption via preferences; however, regional characteristics are as-

sumed independent of individual preferences. The availability of certain foods varies across regions because of differential production and marketing conditions, and differential business cycle developments. For example, Russia is known for the poor quality of its rural roads. More generally, it seems plausible to assume that the quality of infrastructure that is associated with food production and distribution deteriorates as the distance from Moscow increases. Deteriorating macroeconomic conditions such as declining Gross Regional Product (GRP) per capita and rising regional unemployment are expected to stimulate higher alcohol and cigarettes consumption[5,27].

Data and Econometric Strategy

Data from the Russian Longitudinal Monitoring Survey (RLMS) and the Russian Statistical Yearbook (RSY) covering a ten-year transition period are employed to investigate the individual and regional economic determinants of changes in consumption patterns in Russia. The RLMS is a nationally representative household survey that annually samples the population by dwelling units.(I) The RLMS is coordinated by the Carolina Population Center at the University of North Carolina in collaboration with the Russian Academy of Sciences and the Higher School of Economics (http://www.cpc.unc.edu/projects/rlms-hse). Data collected include a wide range of information concerning household characteristics such as demographic composition, income and expenditures, and individual characteristics such as employment status, anthropometric measures, health status, and food, alcohol and tobacco consumption. Data on consumption are based on recall over the last 30 days or/and household dairies. Maximum and minimum prices for about 90 food products in 160 sites are recorded at the community level. Following Ogloblin and Brock[13], the prices for alcohol, tobacco, fat and protein are calculated as weighted geometric averages using both the high and the low prices. In the case of missing information, the prices are imputed from the average for the respective primary sampling unit (PSU). We use relative prices of alcohol, tobacco, fat and protein in the econometric specifications.(II)

We use round 5 (1994) and round 13 (2004) of the RLMS, covering a period from early to late transition. Our goal is to analyze long-term changes in consumption patterns which could potentially result in health relevant outcomes; therefore year-to-year variation seems to be inappropriate. The ten-year time span offers the possibility to analyze long-term changes or persistence in consumption patterns against the background of significant changes in consumers' socio-economic environment during transition. Our sample consists of 2981 individuals in 1598 households that can be identified at the beginning and at the end of the sampling period. The RSY provides data on the regional macroeconomic characteristics over time for the 31 regions covered in our analysis.(III)

Estimating static cross-sectional demand functions implies the assumption of a »steady-state« situation. Given the economic and political developments in Russia during transition this assumption seems rather inappropriate. Therefore, we are interested in changes in demand and specify equation (1) in first differences with 1994 level variables controlling for preferences. To test the hypotheses developed in the previous section, the relationship between changes in food, alcohol, and tobacco consumption (q_i), and household characteristics and regional (macro) economic indicators is estimated by the following econometric model:

$$\Delta q_i = \alpha q_{i1994} + \beta Z_{i1994} + \gamma \Delta I_i + \delta \Delta M_i + \Phi D_i + \Delta \varepsilon_i \quad (2)$$

where Δ refers to change in variables between 1994 and 2004. We include the initial level of the dependent variable (q_{i1994}) to control for preferences and test for habit persistence versus convergence hypothesis[18,30,31]. Z_{i1994} is a vector of initial levels/conditions of individual or household (micro) variables such as education, age, gender, marital status, household size, and access to garden plot that might affect the ease or difficulty of adjusting consumption behavior over the period of analysis. I_i is household income. M_i is a vector of (macro) economic indicators for the region where the individual/household resides. It contains respective changes in relative prices for fat, protein, alcohol and tobacco as well as real GRP per capita change, inflation rate, which is proxied by the change in regional consumer prices, and unemployment rate change. These macroeconomic variables also proxy/control for changes in prices of other relevant goods. Distance between the regional center and the capital Moscow (D_i), in logarithmic form, is also included. Finally, ε_i is a random disturbance term reflecting the impact of unmeasured (exogenous) factors on consumption choices.

(I) RLMS is not a true panel survey where sample households and individuals are followed and interviewed in each round. After 1999, the original design was modified and some households and individuals who moved were surveyed at their new locations. The analyses of the RLMS data for attrition, carried out by the Institute for Social Research at the University of Michigan, show that the exits can be characterized as random and that the sample distributions remain unchanged[28].

(II) The prices are calculated relative to an aggregate price that includes prices for all different types of foods for which expenditure information is available. The weights for alcohol price are the same as the weights to calculate pure alcohol content[29]: 0.05 beer; 0.10 wine; 0.20 fortified wine; 0.40 vodka; 0.40 cognac. The price of fat is based on weights from the USDA National Nutrition Database file: 0.80 butter; 0.78 mayonnaise; 0.70 margarine; 0.20 boiled sausage; 0.28 semi-smoked sausage; 0.28 wieners; 0.65 nuts; 0.30 chocolate candies; and 0.30 chocolate. The price of protein is based on the following weights 0.36 hard cheese; 0.36 eggs; 0.17 beef; 0.15 pork; 0.28 chicken; 0.20 fresh fish; 0.63 salted fish; 0.20 stewed pork, canned; and 0.27 canned fish in oil.

(III) RLMS covers 32 regions in total. However, due to exhibiting outlier behaviour, for example, unemployment rates far higher than the sample average, and its closeness to war-torn Chechenia, the Kabardino-Balkarija region, has been excluded from the estimated sample.

TABLE 1
SUMMARY STATISTICS

Variable	Definition	X	SD
Dependent variables			
Δ Fat consumption	Change in the share of daily calories from fat (in percentage points)	1.19	13.93
Δ Protein consumption	Change in the share of daily calories from protein (in percentage points)	1.20	4.79
Δ Diet diversity	Change in diet composition Berry index values 1994 and 2004	0.25	0.80
Δ Cigarettes consumption	Proportional change in the number of cigarettes smoked *per* day calculated as $[\ln(Cc_{2004}+1) - \ln(Cc_{1994}+1)]$	0.34	1.34
Δ Alcohol consumption	Proportional change in the total amount of alcohol *per* day calculated as $[\ln(C_{A2004}+1) - \ln(C_{A1994}+1)]$	0.31	2.84
Explanatory variables			
Fat	Share (in percent) of daily calories from fat in 1994	33.67	10.83
Protein	Share (in percent) of daily calories from protein in 1994	12.72	3.49
Food diversity	Transformed Berry index in 1994; TBI = ln[BI/(1–BI)]	0.84	0.70
Cigarettes	Number of cigarettes smoked per day in 1994	11.79	8.38
L Cigarettes	Log of number of cigarettes smoked per day in 1994, $\ln(Cc_{1994}+1)$	2.15	1.09
Alcohol	Total quantity of ethanol equivalent consumed *per* day in the last 30 days in 1994 in grams	96.25	151.78
L Alcohol	Log of total amount of alcohol consumed *per* day (in grams) in 1994, $\ln(C_{A1994}+1)$	3.45	1.92
Age	Individual age in years in 1994	43.81	14.80
High school	Dummy=1 if the individual has a high education level in 1994	0.46	0.49
University	Dummy=1 if the individual has university education in 1994	0.16	0.36
Gender	Dummy=1 if the individual is a male	0.39	0.48
Married	Dummy=1 if the individual is married in 1994	0.72	0.44
Garden	Dummy=1 if the individual has access to land plot in 1994	0.78	0.41
L HH size	Log of adult equivalent number of household members	0.80	0.43
Δ HH income	Proportional change in household income	–0.15	0.79
Δ Alcohol price	Proportional change in the relative price of alcohol, 1994 and 2004	2.55	2.40
Δ Cigarettes price	Proportional change in the relative price of cigarettes, 1994 and 2004	0.27	0.50
Δ Fat price	Proportional change in the relative price of fat, 1994 and 2004	2.10	2.43
Δ Protein price	Proportional change in the relative price of protein, 1994 and 2004	2.18	2.31
Δ Real GRP	Proportional change in real Gross Regional Product (GRP) per capita, 1994 and 2004	0.10	0.20
Inflation	Cumulative proportional change in aggregate regional prices, 1994 and 2004	3.66	0.16
Δ Unemployment	Change (in percentage points) in regional unemployment rate, 1994 and 2004	0.70	2.27
Distance	Log of the region's distance to Moscow	6.32	1.96

Notes: Number of individuals in the sample is 2981 and the number of households is 1598. Proportional change multiplied by 100 is equal to a percent change. Level and change in cigarette consumption is reported for only 957 individuals that smoke (in 1994, 2004 or in both years). Level and change in alcohol consumption is reported for only 2181 individuals that drink (in 1994, 2004, or in both years). Change in the Berry index and log of the Berry index in 1994 are given on the basis of 1599 households.

We estimate Equation (2) with five different dependent variables defined as follows:

1) Three variables characterize diet:

a/ share of daily calories from fat (in percent),
b/ share of daily calories from protein (in percent),
c/ diet diversity, measured by a Berry index:

$$BI = 1 - \sum s_j^2$$

where s_j is the share of expenditures on food group *j* in total consumption expenditure[32].[(IV)] Higher values indicate a more diverse diet.

[(IV)] Diet diversity could also be measured using an Entropy index, which assigns higher weights for items with small shares. However, the results are very similar, and are available upon request.

TABLE 2
DISTRIBUTION OF DEPENDENT VARIABLES AND INITIAL CONSUMPTION ACROSS SUBSAMPLES

Variable	Units	Below 1st tercile	Between 1st and 2nd tercile	Above 2nd tercile	Sample X
Dependent variables					
Fat consumption change	Percentage points	9.74	1.22	–12.09	1.19
Protein consumption change	Percentage points	3.31	1.57	–3.27	1.20
Explanatory variables					
Fat consumption in 1994	Percentage points	22.10	33.40	45.52	33.67
Protein consumption in 1994	Percentage points	9.18	12.46	16.52	12.72
		Below median	Above median		
Dependent variables					
Food diversity change	Percentage	68.74	–18.72		28.12
Cigarettes consumption change	Percentage	88.36	–24.91		34.17
Alcohol consumption change	Percentage	72.40	–56.33		31.02
Explanatory variables					
Food diversity in 1994	Index	0.32	1.37		0.84
Cigarettes consumption in 1994	Cigarettes/day	4.99	19.20		11.79
Alcohol consumption in 1994	Grams ethanol/day	21.32	187.08		96.26

2) Alcohol consumption is measured by a continuous variable: pure alcohol (ethanol) consumption per day in grams, defined from self-reported consumption during the last 30 days. It is used in logarithmic form in the estimation.(V)

3) Tobacco consumption is defined in terms of self-reported number of cigarettes smoked per day in a logarithmic form.

All dependent variables except food diversity are measured at the individual level. The food diversity index is calculated at the household level because our data contain expenditure information only for the household.

The following estimation strategies are adopted to analyze changes in individual/household consumption patterns over the ten-year period of transition. A standard Ordinary Least Squares (OLS) estimator is used to analyze changes in fat and protein consumption, and food diversity for the whole sample. A Heckman's two–step procedure is applied to analyze changes in alcohol and cigarette consumption. That is, the OLS estimation of the subsample with non-zero observations includes the inverse Mills ratio to correct for a possible selection bias. For identification in the first step Probit equation we rely on the non-linearities in the model and in addition we include variables identifying individuals as 'old generation' if they were 45 years of age or older in 1994 and who have smoked or drunk alcohol in previous periods, at least as long as half of their current age[16].

Results from the OLS analysis for the whole sample can be interpreted as explaining consumption patters on average. This procedure implies that the direction of change in consumption cannot be evaluated as improving or worsening with respect to some dietary recommendations as it is not known from which level of consumption change takes place for each individual. The risk of inadequate dietary patterns and subsequent health risks is higher at the upper tail of the distribution for fat, alcohol and cigarette consumption than around and below the median.

Therefore, in order to control for heterogeneous consumption patterns and their determinants, samples are split up according to the (cumulative) distribution function of the initial consumption level in 1994. With respect to protein and fat consumption the total sample is split up into three subsamples: below the 33rd percentile of the distribution, between the 34th and the 66th percentile, and above the 66th percentile.(VI) The lower thresholds are at a calorie intake consisting of 28% fat and 11% protein, whereas the upper thresholds are at 38% fat and 14% protein. With respect to diet diversity, alcohol, and cigarette consumption, the sample was divided into two subsamples – below and above the median level of con-

(V) Although Nemtsov[8] criticizes the reliability of the alcohol measure in the RMLS, we believe that changes should be less prone to measurement error than absolute levels.

(VI) We take WHO dietary recommendations as a reference. The median fat share of 32% in our sample is quite close to the WHO recommendation of 30%. The same holds for protein's share with a median of 12% in our sample and the WHO recommendation in the range between 10% and 15%.

TABLE 3
CHANGES IN FAT CONSUMPTION, 1994–2004

	Change in fat share			
	Full sample	Below 1st tercile	Between 1st and 2nd tercile	Above 2nd tercile
Household characteristics				
Fat share in 1994	–0.962*** (0.021)	–1.028*** (0.060)	–0.788*** (0.127)	–0.913*** (0.051)
Age	0.311** (0.113)	0.493*** (0.170)	0.169 (0.189)	0.264 (0.193)
Age squared*10^{-2}	–0.452*** (0.128)	–0.684*** (0.192)	–0.314 (0.206)	–0.349 (0.226)
High school	0.446 (0.394)	0.044 (0.792)	0.640 (0.672)	0.592 (0.725)
University	2.216*** (0.494)	0.588 (0.967)	2.487** (0.904)	3.095*** (0.890)
Gender	–1.463*** (0.473)	–2.031** (0.861)	–1.106 (0.824)	–1.440* (0.837)
Married	0.799 (0.492)	0.713 (0.830)	1.342* (0.777)	0.223 (1.012)
Garden	–0.952** (0.470)	–0.869 (0.823)	–1.044 (0.792)	–0.664 (0.774)
L HH size	–0.254 (0.475)	–0.180 (0.871)	–1.357* (0.711)	0.954 (0.799)
Δ HH income	0.377 (0.260)	–0.039 (0.453)	1.111** (0.480)	–0.013 (0.394)
Regional characteristics				
Δ Fat price	–0.349*** (0.070)	–0.359** (0.142)	–0.271* (0.146)	–0.469*** (0.124)
Δ Real GRP	–0.081 (1.286)	–2.031 (1.958)	1.153 (1.984)	–0.089 (2.177)
Inflation	–0.063 (1.273)	–0.165 (1.874)	0.466 (2.094)	0.692 (2.313)
Δ Unemployment	0.052 (0.094)	0.100 (0.161)	0.206 (0.146)	–0.209 (0.148)
Distance	–0.503*** (0.106)	–0.684*** (0.191)	–0.698*** (0.174)	–0.232 (0.194)
PrSv	–11.311*** (3.657)	–18.947*** (4.184)	–9.631** (4.150)	–5.8646 (4.725)
Constant	37.294*** (5.121)	42.075*** (8.493)	31.928*** (8.745)	28.462*** (9.215)
N	2981	994	994	993
F	179.20***	26.32***	9.29***	26.62***

Notes: *, **, *** denote statistical significance at the 10, 5 and 1 percent level, respectively. Robust standard errors are in parentheses. PrSv is the probability of survival in both waves estimated from Probit model.

sumption.[VII] The medians of the respective distributions in 1994 are for the Berry Index – 0.73, for smoking – 11 cigarettes *per* day, and for drinking – 62 grams of ethanol-equivalent *per* day. Estimating Equation (2) for each subsample, we obtain different vectors of estimated parameters explaining changes in consumption conditional on initial consumption pattern, in 1994.

Table 1 presents the definitions and summary statistics for all variables used in the econometric analysis. Table 2 displays the distribution of consumption changes and initial consumption levels across the subsamples. Changes of the dependent variables over the ten-year period are of special interest. There is on average a small increase in consumption of protein and fat, by about 1 percentage point for each, which represent about 10% and 3% increase, respectively. Consumption of alcohol and cigarettes has increased more substantially, by about one third over the period of analysis. While the magnitudes of changes in fat and protein consumption are quite small they hide substantial heterogeneity in the sample. As clearly shown in Table 2, consumers below the first tercile raised more substantially their fat and protein consumption which is opposite to consumers with high initial consumption levels. These consumers reduced the share of fat by 12 percentage points and share of proteins by 3 percentage points on average. Data suggest a convergence of dietary patterns of Russian consumers towards recommended levels at least with respect to fat and protein. Some convergence takes place also with respect to cigarette and alcohol consumption, but further away from the recommended levels (of very low consumption). Light smokers and drinkers, on the one hand, increased their consumption by almost 90% and more than 70% respectively. On the other hand, heavy smokers and drinkers reduced their consumption, but less substantially, by about 25% and 55% respectively.

[VII] 2024 out of 2981 individuals in the sample never smoked (that means both in 1994 and 2004), and 800 out of 2981 individuals never consumed alcohol. Those individuals are excluded from the analysis of subsamples.

TABLE 4
CHANGES IN PROTEIN CONSUMPTION, 1994–2004

	Change in protein share			
	Full sample	Below 1st tercile	Between 1st and 2nd tercile	Above 2nd tercile
Household characteristics				
Protein share in 1994	–0.911*** (0.020)	–0.957*** (0.067)	–0.646*** (0.158)	–0.994*** (0.043)
Age	–0.014 (0.044)	–0.029 (0.070)	0.032 (0.065)	–0.074 (0.083)
Age squared*10^{-2}	0.020 (0.051)	0.048 (0.081)	–0.044 (0.074)	0.089 (0.095)
High school	0.253 (0.174)	0.462 (0.287)	0.322 (0.309)	0.108 (0.272)
University	0.680*** (0.204)	1.283*** (0.338)	0.468 (0.322)	0.387 (0.431)
Gender	0.168 (0.178)	0.520* (0.314)	–0.047 (0.347)	0.088 (0.306)
Married	0.036 (0.177)	–0.305 (0.274)	–0.094 (0.269)	0.573* (0.318)
Garden	–0.132 (0.176)	–0.147 (0.272)	0.249 (0.337)	–0.462 (0.332)
L HH size	–0.201 (0.164)	–0.287 (0.258)	–0.170 (0.260)	–0.158 (0.276)
Δ HH income	0.253** (0.110)	0.345** (0.152)	0.201 (0.214)	0.256 (0.159)
Regional characteristics				
Δ Protein price	–0.155*** (0.031)	–0.081 (0.053)	–0.191*** (0.049)	–0.172*** (0.052)
Δ Real GRP	–0.612 (0.395)	0.138 (0.738)	–1.665** (0.777)	–0.332 (0.674)
Inflation	–0.236 (0.462)	–0.174 (0.654)	–0.319 (0.795)	–0.221 (0.749)
Δ Unemployment	0.071** (0.033)	0.041 (0.062)	0.127* (0.067)	0.058 (0.061)
Distance	–0.149*** (0.046)	–0.027 (0.067)	–0.235*** (0.069)	–0.192** (0.089)
PrSv	–0.778 (1.133)	0.890 (1.939)	–1.986 (1.744)	–0.877 (1.769)
Constant	14.345*** (2.030)	12.543*** (2.729)	11.974*** (3.744)	17.169*** (3.474)
N	2981	994	994	993
F	188.21***	16.89***	4.11***	43.19***

Notes: *, **, *** denote statistical significance at the 10, 5 and 1 percent level, respectively. Robust standard errors are in parentheses. PrSv is the probability of survival in both waves estimated from Probit model.

Results and Discussion

Tables 3 to 6 present the results from the econometric analysis. We report the results for the whole sample as well as the results for the subsamples. The null hypothesis that all of the estimated coefficients of the explanatory variables in any equation are jointly zero is rejected in all cases. When introducing stepwise the individual/household 1994-level variables estimated coefficients remain stable suggesting no endogeneity problems. For the whole sample initial consumption patterns in 1994 significantly affects the change in consumption over the following decade. Results from models fitted to the subsamples reveal substantial heterogeneity in responses. The hypothesis that the vectors of estimated coefficients across subsamples are equal is rejected at the 5% level by Chow/Wald test for all models. Next, we discuss the estimated coefficients starting with changes in fat consumption (Table 3), followed by changes in protein consumption (Table 4), food diversity (Table 5), and finally changes in drinking and smoking patterns (Table 6).[VIII]

Changes in fat consumption

First, we discuss the results from the whole sample and after that we discuss the similarities and differences in consumption patterns across the subsamples. Fat's initial share of total calorie intake has a negative and statistically significant effect on the change in fat consumption over the decade. A one percentage point increase in the initial share leads to 0.96 percentage point reduction in the share of fat in the diet over the period of analysis suggesting no convergence in behavior. Age has a nonlinear effect on fat consumption. Surprisingly, individuals holding a university degree in 1994 are predicted to increase the share of fat in total calorie intake by slightly

[VIII] Our full sample is balanced and therefore, it is vulnerable to panel selection bias, when the reasons for moving out of the sample are correlated with the dependent variables of interest. To correct for panel selection, a probability of survival (PrSv) (i.e., being in the sample for 10 years) is estimated, in a first step, using Probit model and included in the second step specification. The results of the first step estimation are available from the authors on request.

TABLE 5
CHANGES IN DIET DIVERSITY, 1994–2004

	Change in diet diversity index		
	Full sample	Below median	Above median
Household characteristics			
Diet Diversity in 1994	–0.915*** (0.021)	–0.959*** (0.028)	–0.770*** (0.085)
Age	0.029*** (0.008)	0.034** (0.012)	0.027** (0.011)
Age squared*10^{-2}	–0.036*** (0.009)	–0.042*** (0.014)	–0.034** (0.012)
High school	–0.048 (0.030)	–0.016 (0.041)	–0.073* (0.040)
University	0.023 (0.036)	0.005 (0.052)	0.042 (0.048)
Gender	–0.176*** (0.037)	–0.222*** (0.044)	–0.133** (0.054)
Married	0.024 (0.030)	0.046 (0.045)	–0.001 (0.040)
Garden	–0.036 (0.030)	–0.054 (0.050)	–0.016 (0.037)
L HH size	0.066** (0.026)	0.040 (0.033)	0.113** (0.044)
Δ HH income	0.059*** (0.014)	0.089*** (0.021)	0.021 (0.020)
Regional characteristics			
Δ Alcohol price	0.015 (0.010)	0.020 (0.017)	0.009 (0.010)
Δ Cigarette price	0.050** (0.023)	0.013 (0.042)	0.094** (0.042)
Δ Fat price	–0.071*** (0.013)	–0.083*** (0.018)	–0.044** (0.017)
Δ Protein price	0.011 (0.013)	0.011 (0.020)	0.003 (0.017)
Δ Real GRP	–0.139* (0.073)	–0.158 (0.107)	–0.143 (0.104)
Inflation	–0.036 (0.090)	0.0003 (0.120)	–0.047 (0.117)
Δ Unemployment	0.007 (0.008)	0.010 (0.012)	0.001 (0.012)
Distance	–0.009 (0.008)	–0.012 (0.010)	–0.006 (0.010)
PrSv	–0.920*** (0.183)	–1.125*** (0.275)	–0.789*** (0.269)
lparConstant	1.394*** (0.409)	1.292** (0.510)	1.174** (0.496)
N	1599	800	799
F	185.41***	121.54***	10.25***

Notes: *, **, *** denote statistical significance at the 10, 5 and 1 percent level, respectively. Robust standard errors are in parentheses. PrSv is the probability of survival in both waves estimated from Probit model.

more than 2 percentage points over the decade. Interestingly, households with access to a garden plot show a reduction in fat consumption share. A possible explanation is that households who have access to a garden plot can grow fruits and vegetables; availability of cheap fruits and vegetables induces individuals to substitute those for (more expensively) purchased fat containing food. The change in fat consumption is quite responsive to the fat price indicating that a 10% increase in the own price will reduce the demand for fat by 3.5%. The impacts of the growth in gross regional product (GRP) per capita, inflation, and unemployment on changes in fat consumption are statistically insignificant. However, the distance to the capital, Moscow, has a negative and statistically significant effect on fat consumption. The access of fat-rich (fashionable) food could be more limited in regions outside the capital, where the largest concentration of country's wealthy population lives.

Looking at the results from the subsamples reveals substantial heterogeneity in consumption patterns. The effect of the initial level of fat consumption is the largest in magnitude (less than –1) below the first tercile of the distribution. Thus, consumers, whose diet contained less than 29% fat in 1994, reduce fat consumption more than consumers who consumed a more fat-rich diet in 1994 suggesting convergence in consumption patterns in this subsample. Age has a statistically significant nonlinear impact on fat consumption only in the low-consumption subsample. The impact of academic education increases from the lowest to the highest tercile. More specifically, university education is predicted to have no statistically significant impact for the low-consumption subsample. Looking at individuals in the medium- and high-consumption subsamples, college and university educated individuals are predicted to increase their fat consumption by 2.5 and 3.1 percentage points, respectively.

Changes in household income and household size lead to statistically significant effects in the medium-consumption subsample. Whereas individuals experiencing growth in income are predicted to increase the share of fat in their calorie intake, a growth in household size results in a reduction of fat's share.

TABLE 6
CHANGES IN ALCOHOL AND CIGARETTE CONSUMPTION, 1994–2004

	Change in alcohol consumption			Change in cigarette consumption		
	Full sample	Below median	Above median	Full sample	Below median	Above median
Household characteristics						
Log level of q in 1994	–1.166*** (0.016)	–1.331*** (0.028)	–0.964*** (0.110)	–0.942*** (0.029)	–1.137*** (0.036)	–0.422** (0.190)
Age	–0.011 (0.027)	–0.017 (0.028)	–0.026 (0.043)	0.020 (0.018)	0.004 (0.026)	0.027 (0.029)
Age squared*10^{-2}	–0.009 (0.036)	0.001 (0.037)	0.023 (0.057)	–0.049** (0.023)	–0.041 (0.032)	–0.066 (0.041)
High school	–0.081 (0.103)	–0.135 (0.117)	–0.030 (0.149)	–0.058 (0.063)	–0.149 (0.091)	–0.038 (0.082)
University	–0.277* (0.169)	–0.204 (0.195)	–0.365** (0.185)	–0.655*** (0.168)	–0.863*** (0.215)	–0.667** (0.307)
Gender	0.891*** (0.283)	0.893** (0.329)	–0.070 (0.532)	1.539*** (0.416)	1.619*** 0.489)	1.417* (0.839)
Married	–0.068 (0.108)	0.076 (0.134)	–0.264 (0.187)	0.035 (0.073)	–0.026 (0.104)	0.030 (0.100)
Garden	–0.180* (0.096)	–0.259** (0.124)	–0.032 (0.145)	–0.147 (0.094)	–0.173 (0.120)	–0.248 (0.160)
L HH size	–0.163 (0.121)	–0.339** (0.128)	0.049 (0.206)	–0.058 (0.075)	–0.141 (0.104)	0.023 (0.111)
Δ HH income	0.174** (0.075)	0.188** (0.085)	0.235* (0.132)	–0.044 (0.044)	–0.011 (0.061)	–0.089 (0.069)
Regional characteristics						
Δ Alcohol price	–0.039* (0.022)	–0.047** (0.024)	–0.026 (0.028)			
Δ Cigarette price				–0.163** (0.067)	–0.196*** (0.070)	–0.085 (0.092)
Δ Real GRP	0.048 (0.282)	0.011 (0.324)	0.116 (0.470)	0.147 (0.214)	0.245 (0.281)	0.130 (0.298)
Inflation	0.761*** (0.236)	0.631** (0.292)	0.856** (0.404)	–0.388** (0.199)	–0.126 (0.321)	–0.774*** (0.260)
Δ Unemployment	0.023 (0.022)	–0.001 (0.025)	0.067* (0.038)	0.033** (0.014)	0.041** (0.019)	0.021 (0.024)
Distance	0.093*** (0.029)	0.101*** (0.033)	0.059 (0.056)	–0.054*** (0.016)	–0.084*** (0.023)	–0.017 (0.019)
PrSv	0.099 (0.584)	0.730 (0.710)	–0.447 (0.874)	–0.691* (0.381)	–0.595 (0.630)	–0.768 (0.531)
IMR	–1.397* (0.770)	–1.144 (0.867)	–3.108* (1.658)	0.777** (0.358)	1.063** (0.428)	1.366* (0.719)
Constant	1.347 (0.960)	1.557 (1.284)	1.893 (1.871)	3.044*** (0.820)	2.473* (1.276)	2.279* (1.201)
N	2181	1195	986	957	488	448
F	467.38***	362.43***	7.72***	116.11***	92.72***	1.94**

Notes: Second-stage OLS estimates are reported. *, **, *** indicates statistical significance at 10, 5 and 1 percent level, respectively. Bootstrapped standard errors for 1000 replications are reported in parentheses. PrSv is the probability of survival in both waves estimated from Probit model. IMR denotes Inverse Mills Ratio estimated from (first-step) Probit model.

Individuals in the high-consumption subsample are the most responsive to changes in relative price of fat, followed by the low- and medium-consumption subsamples. Distance from the capital has a significant negative effect on fat consumption only in the low- and medium--consumption subsample. Other regional characteristics fail to show any statistically significant impact on changes in fat consumption patterns.

Changes in protein consumption

The initial consumption patterns significantly affect the changes in protein consumption, pointing to habit persistence. A one percentage point increase in the initial share of protein in the diet leads to a 0.9 percentage point reduction in the share of protein in the diet over the ten-year period. Similar to fat consumption, individuals with university education are predicted to increase protein consumption on average by 0.7 percentage points. Furthermore, increasing household income is predicted to lead to rise in protein consumption. Similar to the fat consumption, the change in the relative price of protein has a statistically significant negative effect on the change in protein consumption. Ten percent increase in the relative price of protein reduces the demand for protein by 1.6 percentage points. Turning to the regional characteristics, the farther an individual lives from Moscow, the more the protein consumption share drops over the period of analysis.

Results from the subsamples again reveal significant heterogeneity in protein consumption patterns. Similar to fat consumption, consumption patterns in 1994 are predicted to have a larger impact on changes in protein consumption for consumers below the lowest and above the highest tercile.

Better educated individuals report a significantly larger increase in protein intake only in the low-consumption subsample. Contrary to results for fat consumption, the predicted effect of university education is diminishing moving from the low- to the high-consumption subsample. The highest impact of university education is predicted to occur in the low-consumption subsample. The estimated coefficient outweighs the effect of initial

protein consumption in this subsample. Around the median and above the second tercile the statistical significance vanishes and the magnitude of the coefficients attached to the variable university education is significantly lower. Being a man increases the protein consumption in the lowest third of the distribution, while being married increases the protein consumption in the high-consumption subsample. Growing household income has a statistically significant and positive effect on the change in protein intake, only for the subsample with the lowest initial consumption. The consumers below the first tercile are not responsive to a change in the relative price of protein, contrary to the consumers in the medium- and high-consumption subsamples where increase in the price by 10% reduces the demand for protein by 1.9 and 1.7 percentage points respectively.

Regarding macroeconomic and regional determinants, the distance to the capital is predicted to negatively and significantly affect changes in protein's share in the diet in the medium- and high-consumption subsamples. That is, individuals who derived more than 11% of their caloric intake from proteins in 1994 experience a larger decrease in protein consumption if they live further away from Moscow. In addition, real GDP per capita and unemployment changes have significant impacts on protein consumption, only for the consumers in the medium-consumption subsample.

Changes in diet diversity

Similar to results on fat and protein, initial consumption pattern significantly affects changes in diet diversity too. Again, this effect is negative but with coefficient larger than –1 pointing to no convergence in demand for food diversity. Age has a positive and significant nonlinear impact on the food diversity index. When household head is a man the diet tends to be less diverse. Increases in household income and size over the ten-year period lead to a more diverse diet which is consistent with other studies on diet diversity[32]. Regarding the regional characteristics, the change in the real GDP per capita has a significant negative effect on diet diversity considering the total sample. This specification differs from the other four, as it includes changes in all relative prices as explanatory variables. The change in the relative price of cigarettes has a significant positive effect on diet diversity, while a change in the relative price of fat reduces diet diversity significantly. It seems that an increase in the price of fat reduces the consumption of food items rich in fats, and consequently reduces diet diversity.

Next, turning to the two subsamples with low and high initial diet diversity, the initial diet diversity index has a significant negative impact, but the magnitude of this effect is larger in the low-diversity subsample. However, even there the coefficient is larger than –1, suggesting persistence of consumption patterns. The estimated coefficient of change in household income points to a catch-up effect, low-diversity households increase their diet diversity with income more than households in the high-diversity subsample; latter fails to show a statistically significant increase in the diversity index. Change in household size has a positive impact on the change in diet diversity for the households which already consumed a more diverse diet.

The results show that the regional macroeconomic indicators beside relative prices do not have any statistically significant impact on changes in diet diversity. The change in the relative price of cigarettes has a significant and positive effect only on the diet diversity in the high-diversity subsample, while the change in the relative price of fat decreases the diversity of diet in both subsamples.

Changes in alcohol and tobacco consumption

The estimated coefficients of initial consumption patterns imply convergence in behaviour, in the case of alcohol consumption (coefficient smaller than –1), but to habit persistence in the case of tobacco consumption (coefficient larger than –1). Our model predicts a lower consumption of tobacco of about 0.9% due to 1% higher initial tobacco consumption. Also, a 1% increase in the initial alcohol consumption leads to a 1.2% decrease in alcohol consumption during the ten-year period.

Individuals with university education decrease smoking and alcohol consumption by 66 and 28% respectively. In line with previous research[9], men experience a higher increase of alcohol and tobacco consumption. Whereas an increase in household income causes an increase in alcohol consumption, income change does not explain changes in tobacco consumption. Individuals with access to a garden plot are predicted to have reduced their alcohol consumption significantly. We speculate that working in the garden may act as a means of working out frustration caused by the transition and sedentary life in general, ultimately leading to lower alcohol consumption.

Regarding the macroeconomic determinants, our results show that the changes in alcohol and tobacco consumption are particularly affected by inflation and unemployment growth. Cumulative inflation between 1994 and 2004 leads to a significant increase in alcohol consumption but to a lower tobacco consumption. However, smoking is predicted to increase in regions with growing unemployment. The estimated coefficients of the alcohol and cigarette relative prices are negative and statistically significant, with the effect being stronger in the tobacco demand model. The distance to the capital Moscow has a negative and significant effect on changes in cigarette consumption, but a positive effect on changes in the alcohol consumption.

Turning to results for subsamples reveals again interesting heterogeneity. Relatively heavier drinkers and smokers in 1994 show a more persistent consumption patterns compared to the subsamples with low initial alcohol and tobacco consumption patterns (below the median), pointing to a convergence within the latter subsamples.

While individuals with university degree do not exhibit statistically different alcohol consumption patterns, they did reduce smoking significantly. The estimated co-

efficients for both subsamples suggest a reduction in tobacco consumption by more than 50%. The individuals with low initial alcohol consumption pattern are more responsive to changes in household size and access to a garden plot. The estimated coefficients of both variables show a reduction of alcohol consumption. Whereas men in the below-median subsample increase alcohol consumption more than women, the above-median subsample shows no gender-related significant differences in drinking patterns. Men increase smoking significantly in both subsamples. Household income changes have significant effect on individuals from both subsamples, indicating increasing alcohol consumption.

In general, regional macroeconomic variables tend to be more important in explaining changes in drinking and smoking patterns compared to fat and protein consumption. Inflation reduces tobacco consumption only in the heavy smoker subsample, while distance to Moscow reduces tobacco consumption only in the light smoker subsample. Distance to the capital increases alcohol consumption in the light drinker subsample. An increase of regional unemployment leads to an increase in alcohol consumption, at least for the above-median consumers, and to an increase in tobacco consumption in the below-median subsample.

Conclusions

The paper focuses on determinants of the changes in alcohol consumption, smoking, and diet quality of Russian adults over the transition period 1994–2004. All such consumption patterns are known to influence directly or indirectly the health of the population. Comparing individual and household specific determinants, on the one hand, and the impact of regional macroeconomic conditions on the other, the results of the analysis clearly attribute a higher impact to the first group of explanatory variables, except in the case of alcohol and tobacco consumption where the effects of macroeconomic conditions are also important. The results suggest that among the micro determinants, initial levels of consumption (predetermined consumption patterns), education, gender, income, and access to a garden plot all have a significant impact on changes in the consumption patterns in Russia. Regarding the macroeconomic variables, inflation has a significant impact on changes in alcohol and tobacco consumption, while unemployment changes significantly impact only smoking behavior. The Russian consumers respond to relative price changes of fat and protein, but the demand for these goods is relatively price inelastic. Consumers of alcohol do respond to income changes, but less so to own-price changes while the smokers are not responsive to income but only to own-price changes.

Past consumption patterns significantly affect the adjustment of consumption of fat, protein, alcohol, and tobacco, as well as diversity of diet over the ten-year transition period. The estimated coefficients point in some (low initial consumption) subsamples to a convergence in behavior while in other (high initial consumption) subsamples there is evidence of habit persistence. The full sample regressions provide information for an »average« consumer. But by looking at subsample regressions conditional on initial consumption patterns, we can compare explanatory variables' impact across the distributions. Regarding fat and protein, consumers at the tails of the distributions are predicted to be more affected by their initial consumption patterns than consumers around the median. With respect to diversity of diet, tobacco and alcohol consumption, consumers below the median display higher sensitivity compared to consumers above the median. The analysis of subsamples conditional on initial consumption patterns reveals significant heterogeneity in consumer behavior.

Our results can be used as a basis for effective policy targeting towards different population groups in Russia. It appears that price and income instruments may not be sufficient tools for driving consumers towards healthier consumption patterns. Consumers with established high consumption patterns are the least responsive. Therefore, for this type of consumer policies affecting directly consumption behavior are needed. Furthermore, the increase in fat consumption among university educated individuals already consuming fat-rich diets provides an alarming signal. Health education has been shown to play important role in modifying consumer behavior. Thus, we suggest that more investment in health-related specific education is required, in addition to general academic education. Furthermore, we find that macroeconomic policies also have some role to play; reducing inflation and unemployment might have beneficial side effects on health, via reduced consumption of tobacco and alcohol.

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KONZUMACIJA HRANE, ALKOHOLA I DUHANA U RUSIJI U VRIJEME TRANZICIJE

S A Ž E T A K

Ovaj rad prikazuje utjecaj individualnih karakteristika, kao i regionalnih makroekonomskih faktora na promjene u konzumaciji masnoće, proteina, alkohola i duhana te na raznolikost same prehrane u ruskom tranzicijskom razdoblju od 1994. do 2004. godine. Rezultati su pokazali da individualne karakteristike poput inicijalnih potrošačkih obrazaca, spola, stupnja obrazovanja, prihoda domaćinstva i pristupa vrtu imaju značajan utjecaj na potrošačko ponašanje. Što se makroekonomskih faktora tiče, inflacija je imala velik utjecaj na konzumaciju alkohola i duhana, dok je nezaposlenost značajno utjecala samo na pušenje. Ruski potrošači reagiraju i na promjene cijene masnoća i proteina, no u manjoj mjeri nego na promjene cijena alkohola i duhana. Također, analize poduzoraka temeljenih na različitim inicijalnim potrošačkim obrascima otkrivaju veliku heterogenost u reakcijama potrošača.