The dynamics of the Russian lifestyle during transition: Changes in food, alcohol and cigarette consumption

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Abstract:

This paper examines changes in aspects of the lifestyle of Russian adults between 1994 and 2004. We present evidence on the impact of individual as well as regional characteristics on changes in fat, protein, alcohol and cigarette consumption, and on diet's diversity. The results from a dynamic econometric model suggest that among individual determinants, initial levels of consumption, gender, holding a university degree, household income changes and having access to a garden plot have a significant impact on the changes in consumption behavior in Russia. Regarding the macroeconomic variables, inflation has a significant impact on changes in alcohol and cigarettes consumption, while unemployment changes significantly impact smoking behavior. Analysis of subsamples conditional on initial consumption behavior reveals significant differences in consumption patterns, which is important for effective policy targeting different population groups in achieving healthier lifestyle choices in Russia.

Key words: food consumption, smoking, alcohol, economic transition, Russia

JEL codes: D12; I12; O52

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Introduction

Political, economic and social reforms in Russia since the collapse of the state-command economy in 1991 have brought significant changes in citizens' lives. The economic downturn signified the real GDP falling to 55 percent of its 1989 level by 1998, the lowest point over the last two decades, and a subsequent recovery to 88 per cent by 2005 (World Bank, 2007). Early transition has also been characterized by emerging open unemployment and exploding inflation during the first years of transition. High inflation, sharp declines 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 (Yemtsov, 2003, Liefert, 2004). As a result, social indicators point to a fall in living standards for some, deteriorating health conditions and increased mortality. One indicator of declining health conditions is the drop in life expectancy during transition. By 2005, Russian male life expectancy was 59 years, a decline of about 5 years compared to 1989; and for Russian females the life expectancy was 72 years, a decline of 2 years (WHO, 2008).

Several studies have examined the reasons for the mortality crisis in the former Soviet republics, in particular Russia, where the life expectancy decline was more severe than in the Central European transition countries (Brainerd and Cutler, 2005; Cockerham, 2000; Shkolnikov et al., 2004, Nemtsov, 2002, Zohoori et al., 1998). The main factors leading to the mortality crisis and poor health in Russia are the unhealthy lifestyles that include heavy alcohol (vodka) and cigarette consumption, a high-fat diet and the lack of

recreational exercise. Additionally, Walberg et al. (1998) highlight the role of accidents and crime for decreasing life expectancy. However, Skolnikov et al. (1997) provide evidence that premature mortality had been increasing already before the start of transition. Therefore, economic turmoil might not be the only reason.

To gain a better understanding of the underlying developments of a decreasing life expectancy, we focus on potential causes for poor health directly. More specifically, the goal of the paper is to examine individual socio-economic and regional macro-economic determinants of changes in food, alcohol and cigarettes consumption that have health-related consequences. Therefore, in the empirical analysis, we examine the change in the shares of fat and protein intake in the diet, an index of food consumption diversity, alcohol consumption, and cigarette smoking using data from the Russian Longitudinal Monitoring Survey (RLMS) between the waves in 1994 and 2004. Our analysis aims to quantify the impact of individual determinants as well as the relative impacts of micro and macro determinants on nutritional behavioral changes. The primary contribution of the paper is the examination of the determinants of changes in food, alcohol and cigarette consumption over the ten-year period, between 1994 and 2004. Furthermore, we test if individual's initial consumption pattern affects changes over the ten-year period differently. Finally, we examine the effects of micro and macro determinants on behavior of different population groups conditional on initial consumption level, which is important in designing effective policies for improving the well being of the Russian population.

The paper continues as follows. First, a review of the literature on nutritional behavior and its changes during times of economic turmoil is presented. Second, hypotheses are

developed, based on various theories of consumption and previous empirical results, to guide our empirical analysis. Third, the data and econometric techniques are described, followed by a discussion of the estimation results. Finally, conclusions are offered.

Economic turmoil and nutritional behavior

There is ample evidence in the literature that individuals who chose to consume large amounts of alcohol, tobacco, and diet rich in fat will have a repercussion on their health, which highlights the importance of lifestyle choices for individual's health status (Chou et al., 2004; Huffman et al., 2008; Lakdawalla et al., 2005; Rashad et al., 2006). Quantitative estimates of the contribution of life-style related factors to premature death in the US amount to more than one-third of the total effect (McGinnis and Foege, 1993; Mokdad et al., 2004). Khaw et al. (2008) examine the combined impact of lifestyle, using a simple health behavior score based on smoking, physical activity, alcohol consumption and fruit and vegetable intake, on mortality in females and males aged 45-79 years old living in the UK. They find that the combined impact of various lifestyles is associated with a variation in mortality equivalent to 14 years in chronological age.

However, all of the studies mentioned focus on developed economies.[1] Analyses specifically focusing on periods of economic turmoil fail to establish a consistent picture. Using South Korean data over the late 1990s, Khang et al. (2005) report a surprising decline in mortality during recessions. The only important negative effect is an increase in suicides, especially for males. Very similar results are reported by Tapia Granados and Diez Roux (2009) for the Great Depression in the U.S. In contrary, Ruhm (1995) using

[1] Most studies mentioned follow static approaches; exceptions, using dynamic approaches, are the papers by Contoyannis and Jones (2004) and Balia and Jones (2008).

U.S. data over the years 1975-1988 shows that increasing alcohol consumption can be driven by economic downturns. Increased stress from the economic turmoil can dramatically affect the lifestyle and diet of the population, as well. Analyzing the severe economic crises in Mexico over the 1980s and 1990s, Cutler et al. (2002) identify a link between availability of public health services and female labor force participation, on the one hand, and mortality among children and the elderly, on the other.[2]

There is a small but growing literature on health outcomes and nutrition in Central and Eastern Europe as well as in the Former Soviet Union; Stillman (2006) presents an excellent review. Heavy alcohol consumption and smoking, a high-fat diet, and lack of leisure-time exercise are the most important causes of heart disease and premature mortality in Russia (Cockerham, 2000). Brainerd and Cutler (2005) show that during the 1990s increased alcohol consumption and psychological stress were significant causes of increasing mortality rates in Russia. Ogloblin and Brock (2003) investigate the risk factors and economics of the decision to smoke in Russia. Baltagi and Geishecker (2006) test a theoretical model of addiction using Russian panel data, and find some evidence of addictive behavior for alcohol consumption of Russian males.

During the pre-transition period all transition countries, except Romania, exhibited significantly higher consumption levels, defined in cereal equivalent, than market economies at comparable income levels (Rask and Rask, 2004). Subsidization of food and, therefore, generally low food prices, on the one hand, and a high prominence of meats in the diet, on the other have been blamed as main reasons. Rask and Rask (2004) identify three turning points in the pattern of food consumption for a panel of several

[2] However, Russia and Mexico might differ with respect to the change in female labour participation during economic downturn. Thus, the results of Cutler et al. (2002) may not be completely transferable to the Russian situation.

transition countries. More specifically, the initial drop in food consumption is followed by stabilization at a lower level and, finally, by an increase in line with increasing income levels. With respect to Russia, the authors point out that the stabilization of food consumption at a new (lower) level was not yet reached by 2004. The relevance of economic factors for patterns of individual food consumption has also been proven by Brosig (2000) and Szabo (1999) for Central and Eastern European Countries.

Interestingly, the large majority of empirical studies that have analyzed determinants of nutrition, food choice, smoking and obesity control for regional variations only by including very broadly defined regional dummy variables. Obviously, there are regional differences in consumption behavior and it is reasonable to assume that regional consumption patterns develop differently. For instance, Simpura and Levin (1997) point to regional differences in alcohol consumption within the Russian Federation and attribute them to cultural and ethnic factors. Therefore, in the next section we develop explicit hypotheses for the effects of several micro and regional (macro) factors on individual (and household) nutritional behavior.

Development of hypotheses

Several theories aim at explaining an individual's decision to consume a certain food or to choose a certain lifestyle. To start with the neoclassical microeconomic theory, individual food demand is a function of income, a good's own price, cross-prices and preferences. Recent examples are Contoyannis and Jones (2004), who present a theoretical model of lifestyle and health production, and Arnade and Gopinath (2006), who develop a demand function for fat as an outcome of dynamic utility maximization.

Arguments of the fat demand function are a consumer's subjective time discount rate, prices (of fat-containing foods), total cumulative fat intake and expenditures. Demand for fat is increasing in expenditures but decreasing in prices and total cumulative fat intake. Against this theoretical background, change in household income and the initial share of fat in total calorie intake are used as proxies for expenditure and cumulated fat intake in the following econometric analysis. Subsequently, a positive sign of household income but a negative sign of initial fat consumption is expected. However fat (lipids) and proteins originate from different foods, in different amounts. Lack of appropriate weights forces us to use the cumulative change in consumer prices to account for the expected decreasing demand in prices.

Drinking and smoking are known as being subject to habit formation, that is, cumulative past consumption creates a "stock" of habit that influences current consumption. Certainly, there is much empirical evidence demonstrating persistence in drinking and smoking over an individual's life time (e.g. Edgerton et al., 1996). An individual who has consumed a large quantity of alcohol or cigarettes in the past will derive less utility from any current consumption level. To test and to control for the habit forming element in the consumption behavior of Russian adults, lagged consumption is included as an argument. A positive coefficient on the lagged drinking and smoking variables will support the hypothesis that drinking and smoking is habit forming.

Beside models grounded in the neoclassical theory, consumption decisions might be influenced by various additional factors, like social norms and individual beliefs with respect to consequences of actions (Petrovici, Ritson and Ness, 2004). Several empirical studies have shown that energy intake follows a life-cycle where generally increasing up

to age around 60 and declining subsequently (e.g., Miquel and Laisney, 2001). Thus, age and other individual characteristics such as gender and education are potentially important factors in the choice of nutrition patterns.

Location-specific factors might also influence the availability of certain foods. Russian regions face a variety of production and marketing conditions and are differently affected by business cycle developments. For example, Russia is known for the poor quality of its rural roads, poor fresh milk handling facilities, and underdeveloped food retail system. Also, in the times of bad harvests, grain-surplus regions restrict exports to other regions. Grain-deficit regions, mainly in the North, have to switch to imports from other countries (Liefert, 2004). More generally, it seems plausible that the quality of infrastructure that is associated with food production and distribution deteriorates as the distance from Moscow increases.

Furthermore, as shown by Sedik and Wiesmann (2003), larger households without access to garden plots suffer a higher level of food insecurity. Both household size and access to garden plots are thus important factors in determining consumption behavior under uncertain economic conditions. However, the magnitude of their effects on consumption changes remains an empirical question.

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 (Ruhm, 1995; Brander and Cutler, 2005).

The following econometric analysis aims at verifying the hypotheses above and generating evidence to answer questions such as if either habit persistence or cumulative intake of certain food has an impact on future consumption behavior.

Data and econometric specification

Data from the Russian Longitudinal Monitoring Survey (RLMS) for 1994 and 2004 and the Russian Statistical Yearbook (RSY) are employed to investigate the micro and regional economic determinants of changes in lifestyle in Russia. The RLMS is a nationally representative household survey that annually samples the population of dwelling units.[3] The RLMS is coordinated by the Carolina Population Center at the University of North Carolina (http://www.cpc.unc.edu/projects/rlms). Data collected include a wide range of information concerning household characteristics such as demographic composition, income and expenditures, and individual characteristics such as employment, anthropometric measures, health status, nutrition, alcohol consumption and medical problems. Data on consumption are based on recall over the last 30 days or/and household dairies. We use round 5 (1994) and round 13 (2004) of the RLMS. The RSY provides data on the regional economic variables of the 31 oblasts and cities covered in our analysis.[4]

To test the hypotheses developed in the previous section, the relationship between changes in food, alcohol and cigarettes consumption and micro and regional economic indicators can be formulated by the following dynamic econometric model:

$$\Delta Y_{it} = \alpha Y_{it-1} + \beta \Delta X_{it} + \gamma \Delta M_{it} + \delta Z_{it-1} + \varepsilon_i, \qquad (1)$$

[3] This 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 (Heeringa, 1997).

[4] The RLMS covers 32 regions. However, due to exhibiting outlier behavior, 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.

where "Δ" refers to difference in time operator, between *t*-1 and *t* for individual *i*. Furthermore, X_i is a vector of micro or socioeconomic variables and M_i is a vector of regional economic indicators for the region where the individual resides. Finally, the vectors Y_{it-1} and Z_{it-1} represent initial levels of consumption and (exogenous) individual characteristics. The dependent variables (Y) are defined as follows:

1) Diet is measured by three variables:

- share of daily calories from fat (in percent) [5],
- share of daily calories from protein (in percent) ,
- food 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 (Thiele and Weiss 2003)[6]. Higher values indicate a more diverse diet.

2) Alcohol consumption is measured by a continuous variable: pure alcohol (ethanol) consumption per day in grams, derived from self-reported consumption during the last 30 days. It is used in a logarithmic form in the estimation.[7]

3) Smoking is defined in terms of 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

[5] We refer from now on to the share of daily calories from fat and protein as share of fat and protein in diet, respectively.

[6] Additionally, food diversity could be measured using an Entropy-Index, which assigns higher weights for items with small shares. However, results are very much the same, and are available upon request.

[7] We follow Schultz (2008) to calculate the ethanol content. The following weights are applied: 0.05 for beer; 0.11 for table wine/champagne; 0.19 for fortified wine; 0.40 for vodka; 0.45 for home-made liquor/samogon; 0.25 for other alcohol. Although Nemtsov (2004) criticizes the reliability of the alcohol measure in the RMLS, we believe that changes should be less prone to measurement error than absolute levels.

expenditure information only for the household. More detailed description of the dependent variables is presented in Table 1.

We have included the initial value of the dependent variable (Y_{it-1}) to account and test for possible dynamics in consumption choices or state dependence, including the habit formation hypothesis (Deaton and Muellbauer, 1980; Ivaschenko, 2005). For example, if there is general convergence of individual or household demand to a new equilibrium level of consumption, the initial period level of consumption is expected to have a negative coefficient in our empirical equations of changes. The initial level of the dependent variables allows for testing the habit formation hypothesis versus the accumulation hypothesis as explained in Arnade and Gopinath (2006).

X_i is a vector of micro or socioeconomic variables such as changes in household income and household size between 1994 and 2004. M_i is a vector of regional economic indicators for the region where the individual resides: changes in real GRP per capita, inflation rate, proxied by the change in regional consumer prices, and unemployment rate. Distance between the regional center and the capital Moscow enters in levels in logarithmic form.

Z_{it-1} is a vector of initial levels of micro variables such as education, age, gender, marital status, and access to land, that might affect the ease or difficulty of adjusting consumption behavior over the transition period of analysis. For example, individuals who have more education may adjust faster to new economic conditions than those who have less education (Huffman 1977; Schultz 1975). Those who are older may adjust more slowly because they have less time to benefit from moving to a new equilibrium in

lifestyle. Finally, ε_i is a random disturbance term reflecting the impact of unmeasured (exogenous) factors on consumption choices.

The following estimation strategies have been used to explain changes in individual consumption over the ten-year period of analysis. First, a standard Ordinary Least Squares (OLS) estimator is used to explain changes in fat and protein consumption, and food diversity for the whole sample. For analyzing changes in alcohol and cigarettes consumption, we employ the Heckman's two–step method to correct for selection bias. At the first stage, the probability of consuming, respectively for alcohol and cigarettes, is estimated and the inverse Mills ratio calculated, to control for the sample selection, and included in the second stage of the corrected OLS estimation. For identification in the first step Probit equation we rely on the non-linearities in the model and in addition we include a variable identifying individuals as 'old generation' if they were 40 years of age or older in 1994. Since the covariance matrix generated by the OLS estimation of the second stage is inconsistent, the correct standard errors are generated using a bootstrapping procedure.

Results from the OLS estimations for the whole sample can be interpreted as explaining behavior on average. Unfortunately, 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 or different homogenous group of individuals. Additionally, the general criticism of this type of growth regression applies as for regression towards the mean with an implicit condition of homogeneity across observations (Quah, 1993; Bernard and Durlauf, 1996). Finally, the risk of inadequate

dietary behavior and subsequent health risks is higher at the tails, for fat, alcohol and cigarettes, especially the upper tail, of the distribution than around the mean.

Therefore, to get a better understanding of consumption changes and their determinants, samples are split up according to quantiles of the initial consumption level. With respect to protein and fat consumption the total sample has been split up into three subsamples depending on the distribution of consumption in 1994: below the 33rd percentile of the distribution, between the 34th and the 66th percentile, and above the 66th percentile.[8] The lower thresholds are at a calorie intake consisting of 28 percent fat and 11 percent protein, whereas the upper thresholds are at 38 percent fat and 14 percent protein. With respect to food diversity, alcohol and cigarettes consumption the samples have been divided into two subsamples—below and above the median level of consumption.[9] The median of the respective distributions in 1994 is at a Berry-Index of 0.73, a consumption of 11 cigarettes per day, and 62 grams of ethanol per day.

Estimating the same specification as in Equation 1 for each subsample, we obtain different vectors of estimated parameters explaining changes in consumption conditional on initial consumption pattern, in 1994. Obviously, samples might overlap, for example, heavy smokers in 1994 may quit cigarettes consumption in 2004 or non-smokers may become smokers in 2004. This analysis of the behavior of different groups (by quantiles) is expected to provide more detailed understanding of individual/household consumption behavior over the ten-year transition period in Russia.

[8] We take WHO dietary recommendations as orientation. The median fat share of 32 percent in our sample is quite close to the WHO recommendation of 30 percent. The same holds for protein's share with a median of 12 percent in our sample and the WHO recommendation in the range between 10 and 15 percent.

[9] 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 1 presents the definitions, means and standard deviations for all variables used in the econometric analysis. Table 2 displays the distribution of consumption changes and initial consumption levels across the subsamples. Our total sample includes 2,981 adults, 18 years of age and older, living in 1,599 households.[10] About 39 percent are males and 72 percent are married. Also, about 78 percent have access to a garden plot in 1994.

Changes of the dependent variables between 1994 and 2004 are of special interest. There is on average a small increase in consumption of protein, by 0.4 percentage points and a small decrease in consumption of fat, by 1 percentage points. Consumption of alcohol has declined substantially, by about 40 percent, while the use of cigarettes has increased by almost 31 percent. 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 their fat and protein consumption which is opposite to consumers with initially high 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 behavior of Russian consumers towards recommended levels at least with respect to fat and protein. A type of convergence takes place also with respect to cigarettes and alcohol consumption, but far from the recommended level. Light smokers and drinkers, on the one hand, increased their consumption by 5.5 cigarettes per day and almost doubled

[10] Our study's sample is a balanced one; the same individuals are interviewed in 1994 and 2004. Therefore, it is vulnerable to panel attrition bias, when the reasons for moving out of the sample are correlated with the dependent variables of interest. To correct for panel attrition, a probability of survival (being in our sample 10 years later) has been estimated using probit models and included in the estimation of the changes in diet, smoking and alcohol consumption. The results of the first step estimation are available from the authors upon request.

alcohol consumption from 21 to 43 g ethanol equivalent per day. On the other hand, heavy smokers and drinkers reduced their consumption.

Tables 1 and 2 about here

Results

Tables 3-6 present the results from the econometric analysis. We report the results for the whole sample as well as the results for the subsamples (based on initial levels of dependent variables). The null hypothesis that all of the estimated coefficients of the explanatory variables in any equation are jointly zero, except for the intercept, is rejected in all cases. For the whole sample initial consumption behavior in 1994 significantly affects the change in consumption over the following decade. Furthermore, results for models fitted to the subsamples reveal structural differences. The hypothesis that the vectors of estimated coefficients across subsamples are equal is rejected at the 5 percent level by a Chow 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 behavior (Table 6).[11]

Changes in fat consumption

Table 3 about here

[11] For changes less than 10 %, the difference in natural logs provides a reasonable approximation of the percentage change. Correct percentage change can be derived by taking exp(predicted value – 1).

First, the results for the whole sample will be discussed, followed by a discussion of the similarities and differences in behavior among the different subsamples based on initial level of fat consumption in 1994. Fat's initial share of total calorie intake has a negative and statistically significant effect on the change in fat consumption over the subsequent decade. A one percentage point increase in the initial share leads, on average, to 0.96 percentage points reduction in the share of fat in the diet, which supports the findings by Arnade and Gopinath (2006). Age has a nonlinear effect on fat changes. Surprisingly, individuals holding a university degree in 1994 are predicted to increase the share of fat in total calorie intake by 2.5 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, grow fruits and vegetables, which will increase the supply of these products. Availability of cheep vegetables and fruits will induce individuals to substitute those for more expensively purchased fats which will possibly lead to a healthier diet. The impact 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. Living farther away from Moscow results in a slower growth of a diet's fat content, other things equal. One interpretation, but not the only one, is that availability of fats, especially fat-rich types of food, is limited or high prices prevent the consumers from purchasing them in regions outside the capital where the largest concentration of country's wealthy population is.

However, looking at the results for the subsamples reveals that some of the effects are different in magnitude and sign. The effect of the initial level of fat consumption is the

largest in magnitude below the first tercile of the sample. Thus, consumers, whose diet consisted of less than 29 percent fat in 1994 reduced fat consumption more than consumers who consumed a more fat-rich diet in 1994. Age has a statistically significant non linear impact on fat changes only for the lower group. 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 lowest subsample. Looking at individuals with initially middle and high fat consumption, higher educated individuals are predicted to increase fat's share by 2.7 and 3.6 percentage points, respectively. Variyam (2002), who used a quantile regression approach, also finds that education had a relatively large effect on levels of saturated fat consumption of males at the upper tail of the nutrient intake distribution in the United States, however in the opposite direction. Based on these observations we conclude that attitudes towards nutritional behavior still differ between Eastern European and Western societies. Turning to changes in household income and household size, the results point to statistically significant effects for the middle group only. Whereas, individuals experiencing a growth in household 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.

Finally, the effect of the distance to Moscow is negative and only statistically significant for the lowest and middle groups. Other regional characteristics fail to show any statistical significant impact on changes in fat consumption.

Therefore, we conclude that our results point to there being different types of consumer responses over the ten-year period depending on the initial consumption

patterns in 1994.Our simulation results show that the heterogeneity of responses across subsamples leads to convergence in fat consumption.

Changes in protein consumption

Table 4 about here

The initial consumption patterns significantly affect the adjustment of protein consumption over the transition too. The estimated coefficient points to convergence in behavior (absence of habit formation) in protein consumption. A one percentage point increase in the initial share of protein in the diet leads to a 0.91 percentage points reduction in the share of protein in the diet over the ten-year period. Similarly to fat consumption, individuals with completed university education are predicted to increase protein consumption, on average by 0.79 percentage points. Furthermore, males are predicted to show a more significant increase, by 0.36 percentage points, in protein consumption compared to women. Finally, increasing household income is predicted to raise protein consumption. Turning to the regional characteristics, the distance to the capital, Moscow is the only statistically significant variable. The farther a household lives from Moscow, the more the protein consumption share over the transition period drops.

More interestingly, results from the disaggregated sample reveal again significant heterogeneity in protein consumption changes. Similarly to fat consumption, the estimated impact of lagged consumption decreases from the lowest to the middle subsample but increases above the middle group again conditional on the initial share of protein in total calorie intake. Individual's consumption in 1994 is predicted to have the largest (in absolute value) impact on changes in protein consumption for the lowest and

highest tercile. The estimated coefficients for the two subsamples, -0.955 and –1, are not statistically different at conventional levels.

Better educated individuals report a significantly higher increase of protein intake. Contrary to results for fat consumption, holding a university degree in 1994 is predicted to have a diminishing effect moving from the lowest to the highest subsample. The highest increase is predicted to occur for the group with the lowest protein consumption in 1994. The estimated coefficient outweighs the effect of initial protein consumption in this subsample. Around the median the size of the coefficient attached to the variable university education is significantly lower. Above the middle group the statistical significance vanishes and the size of the estimated coefficient halves compared to the lowest group. Being male increases the protein consumption for the lowest third, while being married would increase the protein consumption for the group with initially highest consumption level. Growing household income has a statistically significant and positive effect on the change in protein intake only for the lowest households.

Regarding macroeconomic determinants, only the distance to the capital is predicted to negatively and significantly affect changes in protein's share in the diet of individuals in the middle and higher groups. That is, individuals who consumed more than 11 percent proteins in their diet in 1994 experience a larger decrease in proteins' share if they live further away from Moscow.

Changes in food diversity

Table 4 about here

Similarly to the previously reported results, initial consumption significantly affects changes in food diversity. This effect is negative and points to convergence in behavior for food diversity. Age has a positive and significant nonlinear impact on the food diversity index. Households whose head possesses a university degree in 1994 diversified more their diet over the ten-year period than less educated households. Males tend to eat less diverse diet. Increases in the household's income and household size over the ten-year period result in a more diverse diet which is consistent with other studies on food diversity (Thiele and Weiss, 2003). Access to a garden plot leads to a smaller change in food diversity. These households are more likely to rely on food from their garden rather than from the grocery stores and thus end up having less diversified diet. We do not find statistically significant effects of any of the regional characteristics on food diversity if regressing on sample mean.

Next, turning to the two groups of households, defined as consumers with initially (in 1994) less diverse diet (below the median food diversity index) and consumers with initially more diverse diet (above the median food diversity index), the initial food diversity index has a significant impact on both groups, but the magnitude of this effect is larger for the lower quantile households. Although looking alarming, predicted changes in food diversity including all variables turns out to be positive for households initially below the median and negative for households with an initially more diverse diet. The estimated coefficient of change in household's income points to a catch-up effect, whereas lower group households increase food diversity with increasing income statistically and quantitatively to a significantly larger extent compared to above-median households. Latter fail to show a statistically significant increase in the diversity index.

Having an access to a garden plot significantly reduces growth of food diversity for the below median group only. Household size positively impact on the change in food diversity for the upper households. The results show that the regional macro economic indicators do not have any statistically significant impacts on changes in diversity of diet.

Changes in alcohol consumption and smoking behavior

Table 5 about here

The estimated coefficients point to a convergence in behavior (absence of habit formation) for alcohol and cigarettes consumption. The study by Baltagi and Geishecker (2006), did not find support for rational addiction (RA) model of Russian women's alcohol consumption but did find some support for RA in Russian male alcohol consumption. Our model predicts a lower consumption of cigarettes of about 0.94 percentage points due to 1 percent higher initial cigarette consumption level. Also, a 1 percent increase in the initial alcohol consumption level leads to a 1.17 percentage points decrease in alcohol consumption during the ten-year transition period.

Individuals holding university degree at the beginning of the period analyzed decreased cigarette smoking and alcohol consumption by 67 percent and 29 percent, respectively. In line with previous research (e.g., Zohoori et al, 1998) males display a growing alcohol and cigarettes consumption. An increase in an individual's household income over the ten-year period of analysis causes a larger percentage increase in alcohol consumption. But the household income effect on cigarettes consumption is not statistically significant. The availability of garden plots in 1994 leads to a decrease in cigarette and alcohol consumption. Working in the garden may also be a means for

working off frustration caused by the transition, and sedentary life in general, that would otherwise lead to greater consumption of alcohol and cigarettes.

Regarding the macroeconomic determinants of alcohol and cigarettes consumption changes, the results show that the changes in alcohol and cigarettes consumption are particularly affected by inflation and unemployment growth. More specifically, the cumulated change in consumer prices between 1994 and 2004 leads to a significant increase in alcohol consumption. Cigarettes consumption is predicted to decline in regions with a higher inflation, but it increases in regions with growing unemployment. The distance to the capital, Moscow, has a negative and significant effect on changes in cigarette consumption, but a positive effect on changes in alcohol consumption. Living farther away from Moscow reduces smoking but increases drinking. Residents living close to or within the capital are predicted to smoke significantly more during the transition, possibly because the supply and advertising of cigarettes has increased in Moscow since the start of the economic reforms in Russia (Ogloblin and Brock, 2003).

Turning to results for subsamples reveals again interesting heterogeneity. The predicted reduction in the cigarettes and alcohol consumption over the ten years is larger in the subsample with initially lower cigarettes and alcohol consumption levels (below the median) evaluated at the means of subsamples. Relatively heavier consumers of alcohol and cigarettes in 1994 seem to persist stronger in their consumption behavior than light consumers. However, revealed at the subsample means the reduction of initially heavy consumers outweighs quantitatively the reduction in the lower subsample. Thus, pointing again to a convergence between subsamples.

Whereas, individuals holding an academic degree do not exhibit a statistically different alcohol consumption behavior, they reduced smoking at a significantly larger extent. The estimated coefficients for both subsamples suggest a reduction of cigarettes consumption by 50% and more. The individuals with lowest initial alcohol consumption level are more responsive to household size and access to a garden plot, effects of both variables estimated lead to a reduction of alcohol consumption. Whereas males in the below-median subsample increase alcohol consumption more than women, the above-median subsample shows no gender related significant differences in drinking behavior. Household income changes have significant effects on individuals from both groups, resulting in increasing alcohol consumption. Furthermore, males increased smoking significantly in both groups.

In general, regional macroeconomic variables tend to be more important in explaining changes in drinking and smoking behavior compared to fat and protein consumption. Inflation reduces the cigarettes consumption only for the initially heavy smokers, while distance to Moscow reduces the cigarettes consumption only for the initially light smokers. Growth in regional/oblast unemployment is predicted to lead to an increasing alcohol consumption, at least for the upper quantile of alcohol consumers, and increased cigarettes consumption for the lower quantile of smokers.

Conclusions

The paper is focused on the change in alcohol consumption, smoking and some dietary quality characteristics of Russian adults over the transition period, 1994-2004, and its determinants. All such lifestyle changes are expected 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 changes on the other, the results of the preceding analysis clearly attribute a higher impact to the first group of explanatory variables, except in the case of alcohol and cigarettes consumption. The results from the dynamic econometric model suggest that among the micro determinants, initial levels of consumption, holding a university degree, gender, income and having access to a garden plot all have a significant impact on changes in lifestyle and nutritional behavior in Russia. Regarding the macroeconomic variables, inflation has a significant impact on changes in alcohol and cigarettes consumption, while unemployment changes significantly impact smoking behavior. The Gross Regional Product does not have statistically significant impact on nutritional behavior in Russia.

Past consumption behavior significantly affects the adjustment of consumption of fat, protein, alcohol and cigarettes as well as diversity of diet over the ten-year transition period. The estimated coefficients point to convergence of behavior or absence of habit formation for the Russian population. Standard regression model provides information for an 'average' individual. But by looking at regressions on subsamples depending on intial consumption behavior we can compare explanatory variables' impact across the distributions. Regarding fat and protein, households at the tails of the distributions are predicted to be more responsive to changes in their initial consumption than households around the median. With respect to diversity of diet, cigarettes and alcohol consumption households below the median display a larger flexibility than households above the median. Therefore, the analysis of subsamples conditional on initial consumption level reveals significant differences in individual behavior which is important for effective

policy targeting different population groups to make healthier lifestyle choices in Russia. The present study suggests that much more investments in health education is required. Especially, higher growth of fat consumption among better educated individuals already consuming larger shares of calories from fat provides an alarming signal. Furthermore, reducing inflation and unemployment might have beneficial side effects on health via reduced consumption of cigarettes and alcohol.

This paper only provides the ingredients for a deeper analysis on, for example, health characteristics of individuals and groups and factors affecting health directly. A possible extension of our study could be a further exploration of these relationships by combining consumption data with, for example, obesity and life expectancy models.

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Table 1: **Variable definitions, means and standard deviations**

Variable	Definition	Mean	SD
Dependent variables			
Fat consumption change	change in the share of daily calories from fat (in percentage points)	-1.188	13.938
Protein consumption change	change in the share of daily calories from protein (in percentage points)	0.204	4.791
Food diversity change	difference in Berry index values 1994 and 2004	0.251	0.804
Cigarettes consumption change	proportional change in the number of cigarettes smoked per day calculated as $[\ln(Cc_{2004}+1)-\ln(Cc_{1994}+1)]$	0.341	1.348
Alcohol consumption change	proportional change in the total amount of alcohol per day calculated as $[\ln(C_{A2004}+1)-\ln(C_{A1994}+1)]$	-0.310	2.846
Explanatory variables			
Fat	share (in percent) of daily calories from fat in 1994	33.672	10.830
Protein	share (in percent) of daily calories from protein in 1994	12.720	3.490
Food diversity	transformed Berry index in 1994; TBI=ln[BI/(1-BI)]	0.845	0.704
Cigarettes	number of cigarettes smoked per day in 1994	11.790	8.382
Lcigarettes	log of number of cigarettes smoked per day in 1994, $\ln(Cc_{1994}+1)$	2.152	1.091
Alcohol	total grams of ethanol equivalent consumed per day in the last 30 days in 1994	96.255	151.782
Lalchohol	log of total amount of alcohol consumed per day (in grams) in 1994, $\ln(C_{A1994}+1)$	3.453	1.926
Age	individual age in years in 1994	43.813	14.807
High school	dummy=1 if the individual has a high education level (base category is primary education) in 1994	0.461	0.499
University	dummy=1 if the individuals has university education in 1994	0.158	0.365
Gender	dummy=1 if the individual is a male	0.387	0.487
Married	dummy=1 if the individual is married in 1994	0.719	0.449
Garden	dummy=1 if the individual has access to household land/plot in 1994	0.777	0.416
HHsize change	proportional change in the equivalent number of household members	-0.129	0.437
HHincome change	proportional change in household income	-0.146	0.798
Real GRP per capita change	proportional change in real Gross Regional Product (GRP) per capita, 1994 and 2004	0.101	0.206
Pricechange	proportional change in regional prices, 1994 and 2004	3.656	0.163
Unemplchange	change (in percentage points) in regional unemployment rate, 1994 and 2004	0.698	2.271
Distance	log of the region's distance to Moscow	6.325	1.969

Notes: Number of individuals in the sample is 2981 and the number of households is 1599. 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.

Table 2: **Distribution of dependent variables and initial consumption behavior across subsamples**

Variable	Units	Below 1st tercile	Medium tercile	Above 2nd tercile	Mean
Dependent variables					
Fat consumption change	Percentage points	9.742	-1.224	-12.093	-1.188
Protein consumption change	Percentage points	3.308	0.573	-3.274	0.204
Explanatory variables					
Fat	Percent	22.104	33.403	45.520	33.67
Protein	Percent	9.179	12.462	16.517	12.72
		Below median		Above median	
Dependent variables					
Food diversity change		0.687		-0.187	0.251
Cigarettes consumption change		0.883		-0.249	0.341
Alcohol consumption change		0.724		-1.563	-0.310
Explanatory variables					
Food diversity		0.322		1.367	0.845
Cigarettes	Numbers/ day	4.986		19.203	11.790
Lcigarettes		1.390		2.982	2.152
Alcohol	Grams/ day	21.319		187.075	96.255
Lalchohol		2.173		5.004	3.459

Table 3: Estimates of Changes in Calories Consumed from Fat in Russia, 1994-2004

	Change in fat consumption			
	Full sample	Below 1st tercile	Medium tercile	Above 2nd tercile
Household characteristics				
Share of fat in 1994	-0.963***	-1.006***	-0.788***	-0.912***
	(0.021)	(0.059)	(0.128)	(0.051)
Age	0.248**	0.437**	-0.123	0.184
	(0.115)	(0.172)	(0.188)	(0.196)
Age_squared*10^{-2}	-0.378***	-0.616***	-0.260	-0.256
	(0.130)	(0.195)	(0.204)	(0.229)
High_Education	0.562	0.132	0.695	0.833
	(0.396)	(0.814)	(0.685)	(0.732)
University	2.530***	0.875	2.704***	3.570***
	(0.492)	(0.977)	(0.893)	(0.921)
Gender	-1.175**	-1.754**	-0.877	-0.054
	(0.477)	(0.866)	(0.804)	(0.870)
Married	0.759	0.788	1.260	0.101
	(0.494)	(0.831)	(0.771)	(1.031)
HHsize change	-0.284	-0.241	-1.351*	0.931
	(0.478)	(0.870)	(0.709)	(0.795)
HHincome change	0.342	-0.038	1.049**	-0.063
	(0.263)	(0.450)	(0.476)	(0.392)
Garden	-1.404***	-1.364*	-1.371*	-1.329
	(0.474)	(0.878)	(0.765)	(0.837)
Regional characteristics				
Real GRP per	1.171	-0.879	2.305	1.466
capita change	(1.342)	(2.023)	(1.985)	(2.163)
Price change	-0.295	-0.014	0.171	0.143
	(1.309)	(1.888)	(2.140)	(2.307)
Unemplchange	-0.012	0.035	0.179	-0.238
	(0.095)	(0.169)	(0.145)	(0.152)
Distance	-0.451***	-0.613***	-0.652***	-0.198
	(0.109)	(0.197)	(0.173)	(0.194)
Prob_Surv	-9.156***	-16.968***	-8.124**	-2.701
	(2.696)	(4.314)	(4.070)	(4.818)
Constant	36.528***	39.963***	32.333***	29.613***
	(5.358)	(4.314)	(8.936)	(9.258)
N	2981	994	994	993
F	187.96***	27.40***	9.58***	28.42***

Notes: *, **, *** denote statistical significance at the 10, 5 and 1 percent level, respectively. Robust standard errors are in parentheses.

Table 4**: Estimates of Changes in Calories Consumed from Protein in Russia, 1994-2004**

	Change in protein consumption			
	Full sample	Below 1st tercile	Medium tercile	Above 2nd tercile
Household characteristics				
Share of protein in 1994	-0.911***	-0.955***	-0.613***	-1.001***
	(0.020)	(0.068)	(0.155)	(0.043)
Age	-0.056	-0.053	-0.013	-0.125
	(0.044)	(0.070)	(0.064)	(0.084)
Age_squared*10^{-2}	0.069	0.076	0.009	0.147
	(0.051)	(0.080)	(0.073)	(0.097)
High_Education	0.301*	0.488*	0.379	0.162
	(0.180)	(0.290)	(0.314)	(0.275)
University	0.788***	1.335***	0.595*	0.538
	(0.208)	(0.341)	(0.330)	(0.433)
Gender	0.359*	0.640**	0.132	0.321
	(0.183)	(0.316)	(0.238)	(0.313)
Married	0.013	-0.323	-0.139	0.572*
	(0.174)	(0.269)	(0.272)	(0.319)
HHsize change	-0.206	-0.277	-0.181	-0.178
	(0.168)	(0.259)	(0.264)	(0.273)
HHincome change	0.238**	0.335**	0.183	0.241
	(0.112)	(0.151)	(0.264)	(0.157)
Garden	-0.285	-0.205	0.060	-0.693**
	(0.180)	(0.271)	(0.330)	(0.315)
Regional characteristics				
Real GRP per capita change	-0.111	0.349	-0.998	0.295
	(0.408)	(0.699)	(0.756)	(0.677)
Price change	-0.086	-0.113	-0.093	-0.097
	(0.473)	(0.666)	(0.808)	(0.753)
Unemplchange	0.028	0.013	0.078	0.023
	(0.034)	(0.063)	(0.070)	(0.064)
Distance	-0.107**	-0.0001	-0.189**	-0.148*
	(0.046)	(0.066)	(0.068)	(0.087)
Prob_Surv	0.680	1.766	-0.322	0.697
	(1.161)	(1.848)	(1.721)	(1.871)
Constant	13.235***	11.935***	10.059**	16.360***
	(2.081)	(2.767)	(3.718)	(3.499)
N	2981	994	994	993
F	214.88***	16.63***	2.84***	45.97***

Notes: *, **, *** denote statistical significance at the 10, 5 and 1 percent level, respectively. Robust standard errors are in parentheses.

Table 5: **Estimates of Diet's Diversity Changes in Russia, 1994-2004**

	Change in Food Diversity Index		
	Full sample	Below median	Above median
Household characteristics			
Food Diversity	-0.876***	-0.920***	-0.728***
Index in 1994	(0.020)	(0.026)	(0.085)
Age	0.030***	0.023*	0.038***
	(0.009)	(0.013)	(0.012)
Age_squared*10^{-2}	-0.036***	-0.028*	-0.046**
	(0.010)	(0.015)	(0.013)
High_Education	-0.041	-0.031	-0.044
	(0.028)	(0.034)	(0.041)
University	0.063*	0.059	0.070
	(0.037)	(0.054)	(0.046)
Gender	-0.154***	-0.176***	-0.128***
	(0.033)	(0.050)	(0.041)
Married	0.022	0.063	-0.015
	(0.029)	(0.045)	(0.037)
HHsize change	0.054*	0.031	0.093**
	(0.029)	(0.038)	(0.040)
HHincome change	0.078***	0.105***	0.046**
	(0.016)	(0.024)	(0.018)
Garden	-0.093***	-0.147**	-0.043
	(0.028)	(0.052)	(0.036)
Regional characteristics			
Real GRP per	-0.009	0.035	-0.081
capita change	(0.070)	(0.104)	(0.097)
Price change	-0.069	-0.048	-0.049
	(0.086)	(0.119)	(0.102)
Unemplchange	-0.001	0.0002	-0.005
	(0.007)	(0.010)	(0.009)
Distance	0.002	0.001	0.001
	(0.008)	(0.011)	(0.010)
Prob_Surv	-0.759***	-0.835***	-0.692***
	(0.147)	(0.241)	(0.212)
Constant	1.235***	1.359**	0.763
	(0.408)	(0.572)	(0.492)
N	1598	799	799
F	202.45***	121.26***	12.54***

Notes: *, **, *** denote statistical significance at the 10, 5 and 1 percent level, respectively. Robust standard errors are in parentheses.

Table 6: **Second-stage OLS Estimates of Alcohol and Cigarettes Consumption Changes in Russia, 1994-2004**

	Change in Alcohol Consumption			Change in Cigarettes Consumption		
	Full sample	Below median	Above median	Full sample	Below median	Above median
Household characteristics						
Level of dependent	-1.166***	-1.331***	-0.964***	-0.941***	-1.134***	-0.417**
variable in 1994	(0.016)	(0.028)	(0.110)	(0.029)	(0.035)	(0.192)
Age	-0.016	-0.022	-0.031	0.022	0.006	0.028
	(0.027)	(0.027)	(0.044)	(0.018)	(0.026)	(0.029)
Age_squared*10^{-2}	-0.0001	-0.008	0.031	-0.052**	-0.044	-0.068*
	(0.036)	(0.036)	(0.059)	(0.023)	(0.033)	(0.040)
High_Education	-0.083	-0.136	-0.034	-0.060	-0.157*	-0.037
	(0.103)	(0.116)	(0.149)	(0.062)	(0.091)	(0.082)
University	-0.289*	-0.220	-0.379	-0.671***	-0.881***	-0.680**
	(0.169)	(0.191)	(0.289)	(0.167)	(0.217)	(0.303)
Gender	0.849***	0.860**	-0.143	1.252***	1.614***	1.643**
	(0.285)	(0.323)	(0.533)	(0.417)	(0.487)	(0.826)
Married	-0.085	0.062	-0.281	0.038	-0.016	0.029
	(0.107)	(0.132)	(0.176)	(0.074)	(0.105)	(0.099)
HHsize change	-0.169	-0.343**	0.038	-0.059	-0.142	0.023
	(0.120)	(0.128)	(0.204)	(0.075)	(0.119)	(0.111)
HHincome change	0.180**	0.194**	0.245*	-0.046	-0.014	-0.092
	(0.074)	(0.082)	(0.131)	(0.044)	(0.061)	(0.069)
Garden	-0.201**	-0.273**	-0.050	-0.152*	-0.176	-0.253
	(0.094)	(0.120)	(0.145)	(0.093)	(0.118)	(0.158)
Regional characteristics						
Real GRP per	0.120	-0.060	0.194	0.135	0.241	0.119
capita change	(0.280)	(0.321)	(0.473)	(0.211)	(0.280)	(0.298)
Price change	0.785***	0.654**	0.880**	-0.361*	-0.068	-0.765***
	(0.237)	(0.293)	(0.414)	(0.194)	(0.311)	(0.257)
Unemplchange	0.026	0.001	0.072*	0.033**	0.040**	0.021
	(0.021)	(0.025)	(0.038)	(0.014)	(0.019)	(0.024)
Distance	0.096***	0.104***	0.061	-0.055***	-0.082***	-0.018
	(0.029)	(0.033)	(0.057)	(0.016)	(0.023)	(0.019)
Prob_Surv	0.259	0.861	-0.320	-0.745*	-0.645	-0.814
	(0.587)	(0.702)	(0.864)	(0.380)	(0.630)	(0.535)
Mills ratio	-1.588**	-1.297	-3.386**	0.799**	1.073**	1.393*
	(0.777)	(0.845)	(1.640)	(0.360)	(0.429)	(0.706)
Constant	1.282	1.495	1.871	2.947***	2.265*	2.222*
	(0.959)	(1.293)	(1.897)	(0.802)	(1.244)	(1.189)
N	2181	1195	986	957	499	458
F	452.65***	339.12***	8.22***	122.76***	99.64***	2.16**

Notes: *, **, *** indicates statistical significance at 10, 5 and 1 percent level, respectively. Bootstrapped standard errors for 1000 replications in parentheses. The results from the 1st stage are available from the authors