4-29-2011

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

Thomas Herzfeld
Wageningen University

Sonya K. Huffman
Iowa State University, skostova@iastate.edu

Marian Rizov
Middlesex University

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

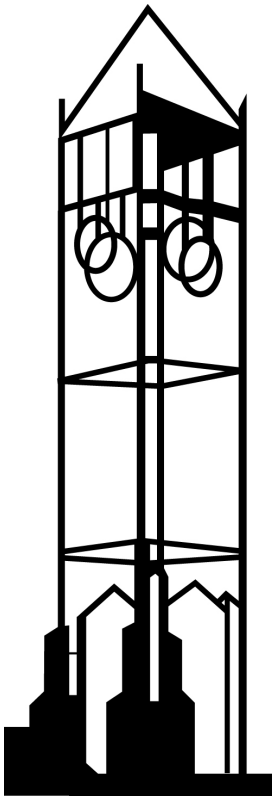
Abstract
This paper presents evidence on the impact of individual as well as regional characteristics on changes in fat, protein, alcohol and cigarette consumption, and on diet's diversity between 1994 and 2004. The results from a dynamic econometric model suggest that among individual determinants such as initial levels of consumption, gender, education, household income changes, and access to a garden plot all 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. Russian consumers only respond to own price changes of fat and protein, but do not respond to own prices for alcohol and cigarettes. Analysis of subsamples conditional on initial consumption behavior reveals significant heterogeneity in consumption patterns, which is important for effective policy targeting different population groups in achieving healthier lifestyle choices in Russia.

Keywords
food consumption, smoking, alcohol, economic transition, Russia

Disciplines
Economics

The Dynamics of the Russian Lifestyle During Transition: Changes in Food, Alcohol and Cigarette Consumption

Thomas Herzfeld, Sonya K. Huffman, Marian Rizov



Working Paper No. 09019
October 2009
Revised on April 2011

IOWA STATE UNIVERSITY
Department of Economics
Ames, Iowa, 50011-1070

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

Thomas Herzfeld,[a] Sonya K. Huffman,[b] and Marian Rizov [c]

[a] Wageningen University, [b] Iowa State University, [c] Middlesex University Business School

Abstract:

This paper presents 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 between 1994 and 2004. The results from a dynamic econometric model suggest that among individual determinants such as initial levels of consumption, gender, education, household income changes, and access to a garden plot all 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. Russian consumers only respond to own price changes of fat and protein, but do not respond to own prices for alcohol and cigarettes. Analysis of subsamples conditional on initial consumption behavior reveals significant heterogeneity in consumption patterns, which is important for effective policy targeting different population groups in achieving healthier lifestyle choices in Russia.

Keywords: food consumption, smoking, alcohol, economic transition, Russia

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

Introduction

Political, economic and social reforms in Russia since the collapse of the socialist economy in 1991 have brought significant changes in citizens' lives. The economic downturn signified 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 (World Bank, 2007). Early transition has also been characterized by emerging open unemployment and exploding inflation. 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, 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 directly on potential causes for poor health. More specifically, we are estimating differential demand functions for macronutrients, cigarettes, and alcohol as well as for diversity of diet. Regional macro-economic measures provide an insight into the effect of economic turmoil on individual consumption changes. In the empirical analysis, we examine the ten-year 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 rounds 5 and 13, covering years 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 long-term changes in food, alcohol and cigarette consumption over the period 1994 - 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, to guide our empirical analysis hypotheses are developed based on various theories of consumption

and previous empirical results,. 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 choose to consume large amounts of alcohol, tobacco, and a diet rich in fat will have a health repercussions, which highlights the importance of lifestyle choices in an 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 United States (US). In contrary, Ruhm (1995) using US data over the years 1975-1988, shows that an increase in 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 significant 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 increased 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. Huffman and Rizov (2007, 2010) study the factors contributing to the rising obesity in Russia and find a strong positive effect of diet and a strong negative effect of smoking on weight and BMI. Palosuo (2000) examine the relationships between health related lifestyles such as diet, smoking, drinking alcohol and exercise, and feelings of alienation of adults living in Moscow and Helsinki, using data from a survey conducted in 1991, which is the beginning of the Russian transition to a market-oriented economy. The sex difference in healthy lifestyles was wider in Moscow but the alienation feelings had stronger association with healthy lifestyles in Helsinki.

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). Low priced, subsidized food, and a high prominence of meats in the diet are primary reasons. Rask and Rask (2004) identify three turning points in the pattern of food consumption for a panel of several 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 prices and 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

Generally, individual's food demand q_i can be modeled as a function of income y, a vector of good's own price and cross-prices $\boldsymbol{p}$ and preferences θ. As we are especially interested in the impact of economic turmoil, a vector $\boldsymbol{z}$ is added representing regional macro-economic characteristics:

(1) $q_i = q(y, \boldsymbol{p}, \theta, \boldsymbol{z})$.

where q_i represents demand for macro-nutrients fat and protein, the demand for tobacco and alcohol as well as a demand for food diversity that is a measure of the quality of an individual's diet.

Income

Arnade and Gopinath (2006) develop a theoretically consistent demand function for fat as an outcome of dynamic utility maximization. As expected, demand for fat is increasing in income. Similarly, demand for protein, cigarettes and alcohol is expected to increase with income. However, the way household income is spent attracted some attention over the last two decades (Chiappori and Donni, 2009). In the econometric analysis total household's income change is included as explanatory variable. Specifications including individual income change will be reported in an Appendix.

Prices

It is straightforward to assume demand to be negatively related with respective own prices. As usual in cross-sectional studies, 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 price indices of tobacco, alcohol, fat, and protein will be included in the econometric models.

Preferences

Various previous studies support the expectation that current preferences are affected by previous consumption. 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 (Taylor and Houthakker, 2010). However, previous consumption might influence current demand in two different ways. 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. Conversely, the formation of habits is linked to a positive coefficient on the lagged drinking and smoking variables.

With respect to demand for fat, Arnade and Gopinath (2006) show that demand is decreasing in total cumulative fat intake due to consumers' awareness of fat consumption's adverse health effects, illustrating the convergence hypothesis. Following the Arnade and Gopinath model, the initial share of fat in total calorie intake is used as proxies for cumulated fat intake in the following econometric analysis. Subsequently, a negative sign of initial fat consumption is expected. On the contrary, previously high consumption of alcohol and cigarettes is expected to result in small but positive changes of demand for these items reflecting the addiction aspect. *A priori*, the relationship between initial protein consumption and changes in protein consumption, as well as initial diversity of a diet and its change is clear. However, some persistence due to habit formation might be expected too.

Age and other individual characteristics such as gender and education are potentially important factors in the choice of nutrition patterns. On the one hand, several empirical

studies have shown that energy intake follows a life-cycle, generally increasing up to age around 60 and declining subsequently (e.g., Miquel and Laisney, 2001). On the other hand, higher aged consumers might adjust more slowly because they have less time to benefit from moving to a new equilibrium in lifestyle. Furthermore, individuals who have more education may adjust faster to new economic conditions than those who have less education (Huffman, 1977; Schultz, 1975).

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.

Regional characteristics

Regional characteristics are assumed to affect consumption via preferences, however, are independent of consumption themselves. First, location-specific characteristics include 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.

Deteriorating macroeconomic conditions such as declining Gross Regional Product (GRP) per capita and rising regional unemployment are expected to stimulate higher alcohol and cigarette consumption (Ruhm, 1995; Brainerd and Cutler, 2005). Russian provinces experience a quite heterogeneous economic growth as illustrated, for instance, by Herzfeld (2008).

Functional form

Estimating static cross-sectional demands implies the assumption of a "steady-state" situation. Given the economic development of Russia over the last years, this assumption seems rather unreliable. Therefore, we are interested in changes in demand. Differentiated demand functions for five items, including fat, protein, alcohol, cigarette consumption, and food diversity are calculated as differences between demand in 2004 and 1994. However, this results in a loss of all variables which have a constant impact on demand over time, e. g. cultural or religious dietary constraints. Hence, income, household size, regional prices, regional welfare level, and regional unemployment is included in the differential form. Fixed variables like distance to Moscow, and where change can not be unambiguously interpreted like access to garden, and age, enter in 1994 levels. Finally, all specifications control for the level of demand in 1994.

The following econometric analysis aims at verifying the hypotheses above.

Data and econometric specification

Panel 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. The community files of the RLMS collect prices for about 90 food products in 160 sites. Maximum and minimum prices were recorded at the community level. Following Ogloblin and Brock (2003), the prices for alcohol, cigarettes, fat and proteins are calculated as weighted geometric averages using both the high and low prices. In the case of missing information on prices, the prices were imputed from the average for the primary sampling unit (PSU). We calculate relative prices of alcohol, cigarettes, fat and protein that are used in the empirical estimation.[4] We use round 5 (1994) and round 13 (2004) of the RLMS. Our sample consists of 2981 individuals in 1598 households that can be identified as repeated observations. The RSY provides data on the regional economic variables of the 31 regions covered in our analysis.[5]

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

(2) $$\Delta q_i = \alpha q_{i1994} + \beta \Delta X_i + \gamma \Delta M_i + \delta Z_{i1994} + \varepsilon_i,$$

where "Δ" refers to difference between 1994 and 2004 for individual *i*. We have included the initial value of the dependent variable (q_{i1994}) to account and test for the habit formation hypothesis versus the accumulation hypothesis (Deaton and Muellbauer, 1980; Ivaschenko, 2005; Arnade and Gopinath, 2006).

Furthermore, 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 including changes in real GRP per capita, inflation rate, which is proxied by the change in regional consumer prices and unemployment rate. In addition changes in relative prices for fat, protein, alcohol and cigarettes are included in the respective regressions. Distance between the regional center and the capital Moscow enters in levels in logarithmic form.

Z_{i1994} is a vector of initial levels of micro (individual or household) 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. Finally, ε_i is a random disturbance term reflecting the impact of unmeasured (exogenous) factors on consumption choices. The dependent variables (q) are defined as follows:

1) Diet is measured by three variables:

- share of daily calories from fat (in percent) [6],
- 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)[7]. 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.[8]

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

The following estimation strategies have been used to analyze 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 cigarette 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 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 the (cumulative) distribution function of the initial consumption level in 1994. With respect to protein and fat consumption the total sample has been split up into three subsamples: below the 33rdpercentile of the distribution, between the 34th and the 66th percentile, and above the 66th percentile.[9] 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 food diversity, alcohol, and cigarette consumption, the samples have been divided into two subsamples—below and above the median level of consumption.[10] 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 2 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 cigarette consumption in 2004 or non-smokers may become smokers in 2004. This analysis of the behavior of different groups (by percentiles) is expected to provide a more detailed understanding of individual/household consumption behavior over the ten-year transition period in Russia.

Table I presents the definitions, means and standard deviations for all variables used in the econometric analysis. Table II 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.[11] About 39 percent are males and 72% are married. Also, about 78% 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%, while the use of cigarettes has increased by almost 31%. 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 II, 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 cigarette 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 more than doubled alcohol consumption from 21 to 43 g ethanol equivalent per day. On the other hand, heavy smokers and drinkers reduced their consumption.

[Tables I and II about here]

Results

Tables III-VI present the results from the econometric analysis.[12] We report the results for the whole sample as well as the results for the subsamples (by percentiles 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% level by a Chow test for all models. Next we discuss the estimated coefficients starting with changes in fat consumption (Table III), followed by changes in protein consumption (Table IV), food diversity (Table V), and finally changes in drinking and smoking behavior (Table VI).[13]

Changes in fat consumption

[Table III about here]

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 by tercile 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 a 0.96 percentage point 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 slightly 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 grow fruits and vegetables, which will increase the supply of these products. Availability of cheap vegetables and fruits will induce individuals to substitute those for more expensively purchased fats, which will possibly lead to a healthier diet. The changes in calories consumed from fat are quite responsive to the fat price indicating that the 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. Living farther away from Moscow results in a lower 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. 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% 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 2.5 and 3.1 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.

Consumers with high fat consumption are the most responsive to changes in relative price of fat, followed by the lower and medium consuming groups. Distance from the capital has a significant negative effect on fat consumption only for the lowest and middle fat consuming groups. Other regional characteristics fail to show any statistically 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. In addition, the individuals in Russia are more responsive to fat price change than to household income.

Changes in protein consumption

[Table IV 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 0.9 percentage point reduction in the share of protein in the diet over the ten-year period. Similar to fat consumption, individuals with completed university education are predicted to increase protein consumption on average by 0.7 percentage points. Furthermore, increasing household income is predicted to raise 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 calories consumed from protein. Ten percent increase in the relative price of protein reduces the demand for protein by 1.6%. Turning to the regional characteristics, the distance to the capital Moscow is a statistically significant variable. The farther an individual lives from Moscow, the more the protein consumption share drops over the transition period.

More interestingly, results from the disaggregated sample reveal again significant heterogeneity in protein consumption changes. Similar 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 consumption in 1994 is predicted to have the largest (in absolute value) impact on changes in protein consumption for consumers below the lowest and above the highest tercile.

Better educated individuals report a significantly higher increase of protein intake only for the lesser protein consuming group. Contrary to results for fat consumption, holding a university degree in 1994 is predicted to have a diminishing effect moving from the first to the third. The highest and statistically significant increase is predicted to occur only 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 and above the second tercile the statistical significance vanishes and the size of the coefficients attached to the variable university education is significantly lower. Being male increases the protein consumption for the lowest third of the distribution, while being married would increase the protein consumption for the group with initially highest protein consumption level. 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 in 1994 are not responsive to a change in the relative price of protein, contrary to the consumers with intially higher protein consumption where the increase in the price by 10% would reduce the demand for protein by 1.9% and 1.7% respectively.

Regarding macroeconomic determinants, the distance to the capital is predicted to negatively and significantly affect changes in protein's share in the diet of individuals in the second and third subsample. That is, individuals who consumed more than 11% proteins in their diet in 1994 experience a larger decrease in proteins' share 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 with medium protein consumption in 1994.

Changes in food diversity

[Table V about here]

Similar to the previously reported results, initial consumption significantly affects changes in food diversity. Again, this effect is negative and points to a convergence in demand for food diversity. Age has a positive and significant nonlinear impact on the food diversity index. Males tend to eat less diverse diet. Increases in household income and 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). Regarding the regional characteristics, the change in the real GDP per capita has a significant negative effect on food diversity if regressing on sample mean. This specification differs from the other five, 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 food diversity, while a change in the relative price of fat reduces food diversity significantly. Increase in the price of fat reduces the consumption of food items rich in fats, and consequently reduces the food diversity.

Next, turning to the two groups of households, defined as consumers with initially (in 1994) less diverse diets (below the median food diversity index) and consumers with initially more diverse diets (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 below-median households. The estimated coefficient of change in a 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.

Change in household size has a positive impact on the change in food 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 diversity of diet. The change in the relative price of cigarettes has a significant and positive effect only on the food diversity for consumers with initially high food diversity index, while the change in the relative price of fat decreases the diversity of the diet for both groups.

Changes in alcohol consumption and smoking behavior

[Table VI about here]

The estimated coefficients point to a convergence in behavior (that is, absence of habit formation) for alcohol and cigarette 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 men's alcohol

consumption. Our model predicts a lower consumption of cigarettes of about 0.9 percentage due to 1% higher initial cigarette consumption level. Also, a 1% increase in the initial alcohol consumption level leads to a 1.2% decrease in alcohol consumption during the ten-year transition period.

Individuals holding a university degree at the beginning of the period analyzed, decreased cigarette smoking and alcohol consumption by 66% and 28% respectively. In line with previous research (e.g., Zohoori *et al.*, 1998), men display a growing alcohol and cigarette 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 cigarette consumption is not statistically significant. Households with access to garden plots in 1994 are predicted to have reduced their alcohol consumption significantly. 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.

Regarding the macroeconomic determinants, the results show that the changes in alcohol and cigarette 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. Cigarette consumption is predicted to increase in regions with growing unemployment. Interestingly, the estimated coefficients of the alcohol and cigarette relative prices are low and statistically insignificant, indicating that the consumers in Russia are not responding to changes in their own prices, and pointing to price inelastic demands for cigarettes and alcohol. 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. Consumers living farther away from Moscow reduced smoking, but increased drinking to a larger extent than consumers living close to or within the capital. Possibly, the supply and advertising of cigarettes has increased more in Moscow compared to other places since the start of the economic reforms in Russia (Ogloblin and Brock, 2003).

Turning to results for subsamples reveals again interesting heterogeneity. The estimated coefficients suggest a larger reduction in the cigarette and alcohol consumption over the ten years in the subsample with initially lower cigarette and alcohol consumption levels (below the median). Relatively heavier consumers of alcohol and cigarettes in 1994 seem to persist. However, revealed at the subsample means the reduction of initially heavy consumers outweighs quantitatively the reduction in the below-median subsample. Thus, pointing again to a convergence between subsamples.

While individuals holding an academic degree do not exhibit a statistically different alcohol consumption behavior, they did reduce smoking to a significant extent. The estimated coefficients for both subsamples suggest a reduction of cigarette consumption by 50% and more. The individuals with lowest initial alcohol consumption levels are more responsive to changes in household size and access to a garden plot. The estimated effects of both variables lead to 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 behavior. Household income changes have significant effects on individuals from both

groups, resulting in increasing alcohol consumption. Furthermore, males increased smoking significantly in both subsamples.

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 cigarette consumption only for initially heavy smokers, while distance to Moscow reduces cigarette consumption only for the initially light smokers. Distance to the capital increases alcohol consumption for the light drinkers. An increase of regional unemployment is predicted to lead to increasing alcohol consumption, at least for the above-median alcohol consumers, and increased cigarettes consumption for the below-median smokers.

Conclusions

The paper is focused on the changes in alcohol consumption, smoking, and some dietary quality characteristics of Russian adults over the transition period 1994-2004, and their determinants. All such lifestyle changes are expected to influence directly or indirectly the health of the population. To compare 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 cigarette consumption. The results from the dynamic econometric models suggest that among the micro determinants, initial levels of consumption, holding a university degree, gender, income, and 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 cigarette consumption, while unemployment changes significantly impact smoking behavior. The Gross Regional Product does not have a statistically significant impact on nutritional behavior in Russia. 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 do not to own-price changes while the smokers are not responsive to any income or own-price changes.

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 in all specifications to a convergence of behavior for the Russian population. That is, our results provide no evidence of habit formation among Russian consumers. Standard regression model provides information for an "average" individual. But by looking at regressions on subsamples depending on initial 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, cigarette 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 investment 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.

Endnotes

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

[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.

[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 prices are calculated relative to an aggregate price that includes prices for all different types of foods for which expenditure information is. The weights for alcohol price are the same as the weights to calculate pure alcohol content (Schultz, 2008): 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.

[5] 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.

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

[7] 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.

[8] 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.

[9] We take WHO dietary recommendations as orientation. 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%.

[10] 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.

[11] 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.

[12] We have included the results with the individual income instead of the household income in the Appendix. The results are very similar.

[13] For changes less than 10 percent, 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).

References:

Arnade, C., & Gopinath, M. (2006). The Dynamics of Individuals' Fat Consumption. *American Journal of Agricultural Economics, 88*(4), 836-850.

Baltagi, B. H., & Geishecker, I. (2006). Rational Alcohol Addiction: Evidence from the Russian Longitudinal Monitoring Survey. *Health Economics, 15*(9), 893-914.

Becker, G. S., & Murphy, K. M. (1988). A Theory of Rational Addiction. *Journal of Political Economy, 96*(4), 675-700.

Bernard, A. B., & Durlauf, S. N. (1996). Interpreting Tests of the Convergence Hypothesis. *Journal of Econometrics, 71*(1/2), 161-173.

Brainerd, E., & Cutler, D. M. (2005). Autopsy on an Empire: Understanding Mortality in Russia and the Former Soviet Union. *Journal of Economic Perspectives, 19*(1), 107-130.

Brosig, S. (2000). *A Model of Household Type Specific Food Demand Behavior in Hungary*. IAMO Discussion Paper No. 30. Institute of Agricultural Development in Central and Eastern Europe. Halle/ Saale.

Chou, S., Grossman, M., & Saffer, H. (2004). An Economic Analysis of Adult Obesity: Results from the Behavioral Risk Factor Surveillance System. *Journal of Health Economics, 23*(3), 565-587.

Chiappori, P.-A. & Donni, O. (2009). *Non-unitary Models of Household Behavior: A Survey of the Literature*. IZA Discussion Paper No. 4603, Bonn.

Cockerham, W. (2000). Health Lifestyles in Russia. *Social Science and Medicine, 51(9)*, 1313 - 1324.

Contoyannis, P., & Jones, A. M. (2004). Socio-economic Status, Health and Lifestyle. *Journal of Health Economics, 23*(5), 965-995.

Cutler, D. M., Knaul, F., Lozano, R., Mendez, O., & Zurita, B. (2002). Financial Crisis, Health Outcomes and Ageing: Mexico in the 1980s and 1990s. *Journal of Public Economics, 84*(2), 279-303.

Deaton, A. S., & Muellbauer, J. (1980). *Economics and Consumer Behavior.* New York: Cambridge University Press.

Edgerton, D. L., Assarsson, B., Hummelmose, A., Laurila, I. P., Rickertsen, K., & Vale Per, H. (1996). *The Econometrics of Demand Systems: With Applications to Food Demand in the Nordic Countries*. Dordrecht: Kluwer Academic Publishers.

Heeringa, S. (1997). Russian Longitudinal Monitoring Survey (RLMS) Sample Attrition, Replenishment, and Weighting in Rounds V-VII. UNC Carolina Population Center, Chapel Hill.

Herzfeld, T. (2008). Inter-regional Output Distribution: A Comparison of Russian and Chinese Experience. *Post-Communist Economies*, *20*(4), 431-448.

Huffman, W. E. (1977). Allocative Efficiency: The Role of Human Capital. *Quarterly Journal of Economics, 91*(1), 59-80.

Huffman W. E., Huffman, S. K., Tegene, A., & Rickertsen, K. (2010). The Economics of Obesity-Related Mortality among High Income Countries. *Forum for Health Economics and Policy*, 13(1), p. 2 (article).

Huffman, S. K., & M. Rizov, (2007). Determinants of Obesity in Transition Economies: The Case of Russia. *Economics and Human Biology,* 5(3), 379-391.

Huffman, S. K., & Rizov, M. (2010). The Rise of Obesity in Transition Economies: Theory and Evidence from the Russia. *Journal of Development Studies,* 46(3), 1-22.

Ivaschenko, O. (2005). The Patterns and Determinants of Longevity in Russia's Regions: Evidence from Panel Data. *Journal of Comparative Economics, 33*(4), 788-813.

Khaw, K. T., Wareham, N., Bingham, S., Welch, A., Luben, R., & Day, N. (2008). Combined Impact of Health Behaviors and Mortality in Men and Women: The EPIC-Norfolk Prospective Population Study. *PLoS Med, 5*, 39-46.

Lakdawalla, D., Philipson, T., & Bhattacharya, J. (2005). Welfare-Enhancing Technological Change and the Growth of Obesity. *American Economic Review, 95*(2), 253-257.

Liefert, W. (2004). Food Security in Russia: Economic Growth and Rising Incomes are Reducing Insecurity. *Food Security Assessment GFA-15*. ERS/ USDA, Washington DC.

McGinnis, J., & Foege, W. H. (1993). Actual Causes of Death in the United States. *Journal of the American Medical Association, 270*, 2207–2212.

Miquel, R., & Laisney, F. (2001). Consumption and Nutrition: Age-intake Profiles for Czechoslovakia 1989-92. *Economics of Transition, 9*(1), 115-151.

Mokdad, A. H., Marks, J. S., Stroup, D. F., & Gerberding, J. L. (2004). Actual Causes of Death in the United States, 2000. *Journal of the American Medical Association, 291*, 1238-1245.

Nemtsov, A. (2002). Alcohol-related Human Losses in the 1980s and 1990s. *Addiction, 97*(11), 1413–1425.

Ogloblin, C., & Brock, G. (2003). Smoking in Russia: The 'Marlboro Man' Rides but Without 'Virginia Slims' for Now. *Comparative Economic Studies, 45*(1), 87-103.

Palosuo, H. 2000. Health-related Lifestyles and Alienation in Moscow and Helsinki. *Social Science and Medicine* 51: 1325-1341.

Petrovici, D. A., Ritson, C., & Ness, M. (2004). The Theory of Reasoned Action and Food Choice: Insights from a Transitional Economy. *Journal of International Food and Agribusiness Marketing, 16*(1), 59-87.

Quah, D. T. (1993). Galton's Fallacy and Tests of the Convergence Hypothesis. *Scandinavian Journal of Economics, 95*(4), 427-443.

Rashad, I., Grossman, M., & Chou, S. (2006). The Super Size of America: An Economic Estimation of Body Mass Index and Obesity in Adults. *Eastern Economic Journal, 32*(1), 133-148.

Rask, K., & Rask, N. (2004). Reaching Turning Points in Economic Transition: Adjustments to Distortions in Resource-based Consumption of Food. *Comparative Economic Studies*, *46*(4), 542-569.

Ruhm, C. J. (1995). Economic Conditions and Alcohol Problems. *Journal of Health Economics, 14*(5), 583-603.

Russian Longitudinal Monitoring Survey (RLMS). Available at http://www.cpc.unc.edu/projects/rlms

Schultz, T. P. (2008). Health Disabilities and Labor Productivity in Russia in 2004. In C. Mete (Ed.), *Economic Implications of Chronic Illness and Disability in Eastern Europe and the Former Soviet Union* (pp. 85-118). Washington D.C.: World Bank.

Schultz, T. W. (1975). The Value of the Ability to Deal with Disequilibria. *Journal of Economic Literature, 13*(3), 827-846.

Sedik, D., & Wiesmann, D. (2003). *Globalization and Food and Nutrition Security in the Russian Federation, Ukraine and Belarus*. ESA Working Paper No. 03-04, Agriculture and Economic Development Analysis Division. Rome: FAO.

Shkolnikov, V. M., Mesle, F., & Vallin, J. (1997). Recent Trends in Life Expectancy and Causes of Death in Russia, 1970-1993. In J. L. Bobadilla, C. A. Costello, & F. Mitchell (Eds.), *Premature Death in the New Independent States* (pp. 34-65). Washington D.C.: National Academy Press.

Shkolnikov, V., Andreev, E., Leon, D., McKee, M., Mesle, F., & Vallin, J. (2004). Mortality Reversal in Russia: the Story so Far. *Hygiea Internationalis, 4*(1), 29–80.

Simpura, J., & Levin, B. M. (1997). *Demystifying Russian Drinking: Comparative Studies from the 1990s*. Helsinki: National and Development Center for Welfare and Health.

Stillman, S. (2006). Health and Nutrition in Eastern Europe and the Former Soviet Union during the Decade of Transition: A Review of Literature. *Economics and Human Biology, 4*(1), 104-146.

Szabo, M. (2001). Changes in the Hungarian Food Consumption Patterns during the Nineties. In S. Brosig, & M. Hartmann (Eds.), *Analysis of Food Consumption in Central and Eastern Europe: Relevance and Empirical Methods* (pp. 157–167). Kiel: Wissenschaftsverlag Vauk KG.

Tapia Granados, J., & Diez Roux, A. V. (2009). Life and Death During the Great Depression. *Proceedings of National Academy of Sciences of the United States of America – PNAS, 106*(41), 17290-17295.

Taylor, L. D. & Houthakker, H. S. (2010). *Consumer Demand in the United States: Prices, Income, and Consumption Behavior*. New York: Springer.

Thiele, S, & Weiss, C. R. (2003). Consumer Demand for Food Diversity: Evidence for Germany. *Food Policy, 28*(2), 99-115.

Variyam, J. N., Blaylock, J., & Smallwood, D., (2002). Characterizing the Distribution of Macronutrient Intake among U.S. Adults: A Quantile Regression Approach. *American Journal of Agricultural Economics, 84*(2), 454-466.

Walberg, P., McKee, M., Shkolnikov, V., Chenet, L., & Leon, D. A. (1998). Economic Change, Crime, and Mortality in Russia: Regional Analysis. *British Medical Journal, 317*(7154), 312-318.

WHO. (2008). *European Health for All Database (HFA-DB).* Available at http://data.euro.who.int/hfadb/. Copenhagen: WHO Regional Office for Europe [September 2008].

World Bank. (2007). *World Development Indicators*. CD-Rom, Washington D.C.: World Bank.

Yemtsov, R. (2003). *Quo Vadis? Inequality and Poverty Dynamics across Russian Regions*. UNU/ WIDER Discussion Paper No. 2003/67, Helsinki: World Institute for Development Economics Research.

Zohoori, N., Mroz, T. A., Popkin, B. N., Glinskaya, E., Lokshin, M., Dominic, M., Kozyreva, P., Kosolapov, M., & Swafford, M. (1998). Monitoring the Economic Transition in the Russian Federation and its Implications for the Demographic Crisis: The Russian Longitudinal Monitoring Survey. *World Development, 26*(11), 1977-1993.

Table I: 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
Alcohol price change	proportional change in the relative price of alcohol, 1994 and 2004	2.553	2.408
Cigarettes price change	proportional change in the relative price of cigarettes, 1994 and 2004	0.272	0.503
Fat price change	proportional change in the relative price of fat, 1994 and 2004	2.098	2.437
Protein price change	proportional change in the relative price of protein, 1994 and 2004	2.183	2.310
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
HH size change	proportional change in the equivalent number of household members	-0.129	0.437
HH income 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
Aggregate price change	proportional change in aggregate regional prices, 1994 and 2004	3.656	0.163
Unempl change	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 II: **Distribution of dependent variables and initial consumption behavior across subsamples**

Variable	Units	Below 1st tercile	Between 1st and 2nd tercile	Above 2nd tercile	Sample 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 III: Estimates of Changes in Calories Consumed from Fat in Russia, 1994-2004

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

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

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

Table V: 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 Index in	-0.915***	-0.959***	-0.770***
1994	(0.021)	(0.028)	(0.085)
Age	0.029***	0.034**	0.027**
	(0.008)	(0.012)	(0.011)
Age_squared*10^{-2}	-0.036***	-0.042***	-0.034**
	(0.009)	(0.014)	(0.012)
High_Education	-0.048	-0.016	-0.073*
	(0.030)	(0.041)	(0.040)
University	0.023	0.005	0.042
	(0.036)	(0.052)	(0.048)
Gender	-0.176***	-0.222***	-0.133**
	(0.037)	(0.044)	(0.054)
Married	0.024	0.046	-0.001
	(0.030)	(0.045)	(0.040)
HHsize change	0.066**	0.040	0.113**
	(0.026)	(0.033)	(0.044)
HHincome change	0.059***	0.089***	0.021
	(0.014)	(0.021)	(0.020)
Garden	-0.036	-0.054	-0.016
	(0.030)	(0.050)	(0.037)
Regional characteristics			
Real GRP per capita	-0.139*	-0.158	-0.143
change	(0.073)	(0.107)	(0.104)
Price change	-0.036	0.0003	-0.047
	(0.090)	(0.120)	(0.117)
Alcohol price change	0.015	0.020	0.009
	(0.010)	(0.017)	(0.010)
Cigarettes price change	0.050**	0.013	0.094**
	(0.023)	(0.042)	(0.042)
Fat price change	-0.071***	-0.083***	-0.044**
	(0.013)	(0.018)	(0.017)
Protein price change	0.011	0.011	0.003
	(0.013)	(0.020)	(0.017)
Unemplchange	0.007	0.010	0.001
	(0.008)	(0.012)	(0.012)
Distance	-0.009	-0.012	-0.006
	(0.008)	(0.010)	(0.010)
Prob_Surv	-0.920***	-1.125***	-0.789***
	(0.183)	(0.275)	(0.269)
Constant	1.394***	1.292**	1.174**
	(0.409)	(0.510)	(0.496)
N	1599	800	799
F	185.41***	121.54***	10.25***

Table VI: 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 variable 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_Education	-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 (0.285)	-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)	1.239*** (0.416)	1.619*** 0.489)	1.617* (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)
HHsize change	-0.163 (0.121)	-0.339** (0.128)	0.049 (0.206)	-0.058 (0.075)	-0.141 (0.104)	0.023 (0.111)
HHincome change	0.174** (0.075)	0.188** (0.085)	0.235* (0.132)	-0.044 (0.044)	-0.011 (0.061)	-0.089 (0.069)
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)
Regional characteristics						
Real GRP per capita change	0.048 (0.282)	0.011 (0.324)	0.116 (0.470)	0.147 (0.214)	0.245 (0.281)	0.130 (0.298)
Price change	0.761*** (0.236)	0.631** (0.292)	0.856** (0.404)	-0.388** (0.199)	-0.126 (0.321)	-0.774*** (0.260)
Alcohol Price change	-0.024 (0.017)	-0.017 (0.024)	-0.026 (0.028)			
Cigarettes Price change				0.063 (0.057)	0.096 (0.070)	0.035 (0.092)
Unemplchange	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)
Prob_Surv	0.099 (0.584)	0.730 (0.710)	-0.447 (0.874)	-0.691* (0.381)	-0.595 (0.630)	-0.768 (0.531)
Mills ratio	-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: *, **, *** 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

Appendix

Table A.I: Estimates of Changes in Calories Consumed from Fat in Russia, 1994-2004

	Change in fat consumption			
	Full sample	Below 1st tercile	Between 1st and 2nd tercile	Above 2nd tercile
Household characteristics				
Share of fat in 1994	-0.963***	-1.019***	-0.787***	-0.914***
	(0.021)	(0.060)	(0.127)	(0.050)
Age	0.296**	0.489***	0.115	0.272
	(0.114)	(0.168)	(0.186)	(0.191)
Age_squared*10^{-2}	-0.436***	-0.672***	-0.263	-0.359
	(0.128)	(0.191)	(0.202)	(0.223)
High_Education	0.463	0.138	0.724	0.603
	(0.391)	(0.803)	(0.680)	(0.724)
University	2.229***	0.658	2.558**	3.075***
	(0.495)	(0.978)	(0.906)	(0.888)
Gender	-1.416***	-2.067**	-0.888	-1.446*
	(0.474)	(0.840)	(0.814)	(0.842)
Married	0.820*	0.715	1.420*	0.214
	(0.487)	(0.817)	(0.757)	(1.016)
HHsize change	0.011	-0.245	-0.612*	0.918
	(0.478)	(0.821)	(0.671)	(0.800)
Individual income	0.047	0.188*	-0.001	-0.077
change	(0.054)	(0.099)	(0.080)	(0.073)
Garden	-1.024**	-0.850	-1.455**	-0.659
	(0.466)	(0.828)	(0.742)	(0.767)
Regional characteristics				
Real GRP per	0.027	-2.101	1.888	-0.160
capita change	(1.290)	(1.944)	(1.984)	(2.171)
Price change	0.039	-0.247	0.755	0.670
	(1.272)	(1.877)	(2.097)	(2.290)
Fat price change	-0.348***	-0.371**	-0.248*	-0.470***
	(0.070)	(0.144)	(0.147)	(0.125)
Unemplchange	0.043	0.106	0.193	-0.208
	(0.093)	(0.159)	(0.144)	(0.146)
Distance	-0.502***	-0.692***	-0.660***	-0.229
	(0.107)	(0.188)	(0.175)	(0.194)
Prob_Surv	-10.885***	-18.889***	-8.202**	-6.002
	(2.675)	(4.088)	(4.050)	(4.678)
Constant	37.008***	41.952***	31.102***	28.536***
	(5.121)	(8.493)	(8.606)	(9.150)
N	2981	994	994	993
F	171.45***	27.96***	8.67***	27.46***

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

Table A.II: Estimates of Changes in Calories Consumed from Protein in Russia, 1994-2004

	Change in protein consumption			
	Full sample	Below 1st tercile	Between 1st and 2nd tercile	Above 2nd tercile
Household characteristics				
Share of protein in 1994	-0.912***	-0.953***	-0.653***	-0.994***
	(0.020)	(0.067)	(0.157)	(0.043)
Age	-0.024	-0.046	0.0233	-0.083
	(0.044)	(0.070)	(0.066)	(0.084)
Age_squared*10^{-2}	0.030	0.067	-0.034	0.097
	(0.051)	(0.081)	(0.075)	(0.096)
High_Education	0.265	0.463	0.322	0.133
	(0.174)	(0.285)	(0.310)	(0.270)
University	0.688***	1.298***	0.465	0.406
	(0.201)	(0.328)	(0.319)	(0.427)
Gender	0.196	0.588*	-0.014	0.109
	(0.176)	(0.312)	(0.342)	(0.305)
Married	0.050	-0.297	-0.094	0.591*
	(0.176)	(0.271)	(0.275)	(0.322)
HHsize change	-0.022	-0.032	-0.037	0.022
	(0.152)	(0.239)	(0.234)	(0.265)
Individual income change	0.039**	0.028	0.065**	0.028
	(0.016)	(0.029)	(0.032)	(0.026)
Garden	-0.178	-0.183	0.170	-0.495
	(0.380)	(0.272)	(0.322)	(0.332)
Regional characteristics				
Real GRP per capita change	-0.544	0.255	-1.614**	-0.307
	(0.380)	(0.729)	(0.767)	(0.668)
Price change	-0.167	-0.091	-0.238	-0.140
	(0.467)	(0.650)	(0.791)	(0.752)
Protein price change	-0.155***	-0.079	-0.195***	-0.172***
	(0.032)	(0.053)	(0.050)	(0.051)
Unemplchange	0.065**	0.036	0.127*	0.048
	(0.033)	(0.062)	(0.068)	(0.059)
Distance	-0.149***	-0.024	-0.237***	-0.193**
	(0.046)	(0.068)	(0.072)	(0.090)
Prob_Surv	-0.503	1.390	-1.690	-0.679
	(1.122)	(1.939)	(1.732)	(1.771)
Constant	14.136***	12.245***	11.787***	16.934***
	(2.030)	(2.695)	(3.680)	(3.490)
N	2981	994	994	993
F	191.70***	16.89***	3.44***	41.88***

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

Table A.III: 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	-1.168***	-1.328***	-0.977***	-0.937***	-1.134***	-0.410**
variable in 1994	(0.016)	(0.027)	(0.111)	(0.089)	(0.036)	(0.192)
Age	-0.002	-0.007	-0.013	0.020	0.005	0.013
	(0.027)	(0.028)	(0.041)	(0.018)	(0.025)	(0.028)
Age_squared*10^{-2}	-0.032	-0.026	-0.011	-0.045**	-0.042	-0.037
	(0.034)	(0.036)	(0.052)	(0.023)	(0.032)	(0.037)
High_Education	-0.061	-0.112	0.013	-0.051	-0.154*	-0.008
	(0.103)	(0.119)	(0.147)	(0.063)	(0.092)	(0.081)
University	-0.142	-0.029	-0.175	-0.606***	-0.859***	-0.467*
	(0.170)	(0.180)	(0.275)	(0.159)	(0.215)	(0.284)
Gender	1.260***	1.308***	0.602	1.065**	1.592***	0.854
	(0.256)	(0.285)	(0.418)	(0.380)	0.475)	(0.692)
Married	0.004	0.155	-0.141	0.040	-0.023	0.057
	(0.105)	(0.130)	(0.186)	(0.073)	(0.104)	(0.100)
HHsize change	-0.059	-0.230**	0.185	-0.080	-0.149	0.003
	(0.102)	(0.109)	(0.174)	(0.071)	(0.096)	(0.106)
Individual income	-0.010**	0.010	-0.026	0.010	0.014	0.012
change	(0.012)	(0.011)	(0.020)	(0.008)	(0.012)	(0.008)
Garden	-0.233**	-0.320**	-0.122	-0.114	-0.168	-0.128
	(0.100)	(0.123)	(0.159)	(0.094)	(0.126)	(0.149)
Regional characteristics						
Real GRP per capita	0.044	-0.011	0.102	0.119	0.229	0.094
change	(0.279)	(0.324)	(0.467)	(0.214)	(0.277)	(0.290)
Price change	0.747***	0.595**	0.838**	-0.381*	-0.099	-0.748***
	(0.237)	(0.290)	(0.400)	(0.199)	(0.319)	(0.254)
Alcohol Price	-0.028	-0.022	-0.032			
change	(0.017)	(0.024)	(0.027)			
Cigarettes Price				0.067	0.093	0.050
change				(0.056)	(0.069)	(0.093)
Unemplchange	0.009	-0.017	0.047	0.034**	0.043**	0.020
	(0.022)	(0.025)	(0.035)	(0.014)	(0.018)	(0.024)
Distance	0.092***	0.097***	0.058	-0.055***	-0.085***	-0.013
	(0.029)	(0.034)	(0.056)	(0.016)	(0.023)	(0.019)
Prob_Surv	0.299	0.978	-0.225	-0.699*	-0.644	-0.529
	(0.599)	(0.707)	(0.900)	(0.383)	(0.622)	(0.523)
Mills ratio	-0.333	0.043	-1.073	0.633**	1.053**	0.688
	(0.675)	(0.753)	(1.327)	(0.320)	(0.411)	(0.603)
Constant	0.769	0.982	0.890	3.169***	2.370*	3.003**
	(0.905)	(1.268)	(1.669)	(0.816)	(1.275)	(1.148)
N	2181	1195	986	957	499	458
F	468.24***	375.07***	7.66***	114.24***	92.63***	2.05**

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 upon request.