
LONG-TERM TRENDS IN FOOD CONSUMPTION: COMPARISON BETWEEN SERBIA AND GREECE

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ABSTRACT

This study analyses the relationship between food consumption and income, taking the consumption (per capita) of different food categories and GDP (per capita) as indicators. It presents the time series trends and compares the food consumption patterns for two countries – Serbia and Greece - an upper-middle income country outside of the EU and a high-income EU member country, respectively. The analysis showed that consumption of all food groups in Serbia (except milk) over two decades (1994-2016) is significantly affected by the changes in the GDP; while in Greece, only consumption of meat, fruits, grains, and sweetened products was positive or negative influenced by GDP. Trend analysis of the consumption of the different food categories showed huge differences between the two countries.

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Introduction

Dietary changes associated with economic growth have been extensively studied in many countries (Monteiro *et al.*, 2004; Popkin, 2001; Popkin, 2002; Popkin, 2006; Lipoeto *et al.*, 2004; Janhs *et al.*, 2003; Ghassemi *et al.*, 2002; Kim *et al.*, 2002; Gerbens-Leenes *et al.*, 2010; Madanat *et al.*, 2008; Burggraf *et al.*, 2015). However, there is insufficient research available on nutritional changes in countries heavily affected by economic transitions (Ivanova *et al.*, 2006), wars, disintegration and political crisis.

Thus, the first country we selected for the analyses was Serbia - a very particular case of middle-income countries: its economy has halved concerning the early 1990s. It is one of the economies in Central and Southeastern Europe (CEEs), whose system radically

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changes from the centrally planned to the market economy after the 1990s; country that indirectly experienced civil war (1991-1999), NATO bombing (March-June 1999), international economic sanctions (several rounds - 1992-1995; 1998-1999); an influx of about one million refugees, gray economy and the biggest hyperinflation after World War II (Brankov and Lovre, 2017). A severe downturn in a nation's economy and a radical increase in food prices (Lovre and Brankov, 2015) has affected a population's ability to get a healthful diet. A serious decline in dietary energy recorded: from 3,698 kcal/capita/day in 1988 to 2,890 in 2011 (Brankov, 2018). As a result, the long-term health problems reflected in increased mortality from nutrition-related non-communicable diseases (NCDs) occurred (Simic *et al.*, 2010; Vujcic *et al.*, 2013). Inadequate economic access to food is most probably one of the reasons for the black demographic situation: about 600,000 Serbs have left the country over the past 25 years (Brankov, 2018). Owing to the decline in domestic demand Serbia has preserved to a great extent its food self-sufficiency. There is a positive trade balance of agri-food products since 2005 (Zekic *et al.*, 2013).

Contrary to Serbia, Greece joined the European Community in 1981, and since the end of the civil war in 1949, it has not experienced war on its territory (Kalaitzidis and Zahariadis, 2015). Consequently, the average dietary energy supply remains stable over time and amounts to more than 3,600 kcal/capita/day since the 1990s (FAO, 2015). According to the latest World Bank data Greece had in 2017, 3.8 times higher GDP per capita than Serbia; 23,027.4 vs 5,992.3 (constant 2010 US\$).

Apart from differences, there are significant similarities among these two countries - starting from the evolution of the taxation system and institutions (Tuncer, 2017) to many cultural, and religious issues. Therefore, it seems reasonable to compare Serbia, which is under the process of accession to the EU, with Greece an 'old' EU member, for which it ties a lot.

The article explores several themes that relate to: (i) a broad overview of the dynamic shifts in diets; (ii) information that shows that the shift in stages of the nutrition transition in the developing world differs from developed world; (iii) information that shows that there are a market changes in diet concurrent with income increases.

Materials and methods

Input data collection

We used publicly accessible per capita food consumption data provided by the national statistical offices. Statistical Office of the Republic of Serbia provides estimates of quantities of consumed food and drink items in households by conducting the survey that covered the whole territory of the country (SORS, 2017). Two-stage of random sampling were used to generate a sample: first, random sampling in the districts was conducted; second, individual households were selected according to the sample plan. The survey covered between 6,457 and 8,896 households in estimated years, which corresponds to around 0.4%-0.5% of the total Serbian population. System of

assessment was executed in a standard way applied for a two-stage stratified sample, i.e. the selection procedure for the first stage was in proportion to the size and repeated, while for the second stage it was simple random non-repeated selection.

Similarly, Greek data were provided from the Hellenic Statistical Authority (HSA). Data is derived from the annual Household Budget Survey (HBS). The data regarding the years 1994-2016 and they represent the monthly average of quantities of certain items (food, beverages, tobacco, and fuel) consumed by the household in the whole country.

Data analysis

This study firstly assesses the GDP changes over time in both countries. We applied both trend analysis and a forecast for the consumption of the majority food groups at a four years period. Secondly, we evaluate the relationship between GDP and consumption of specific food groups. The major variables – *per capita* income and quantity of foods were analyzed by the linear association between these variables using linear regression models having the variable of interest as the outcome and income (continuous variable) as the explanatory variable.

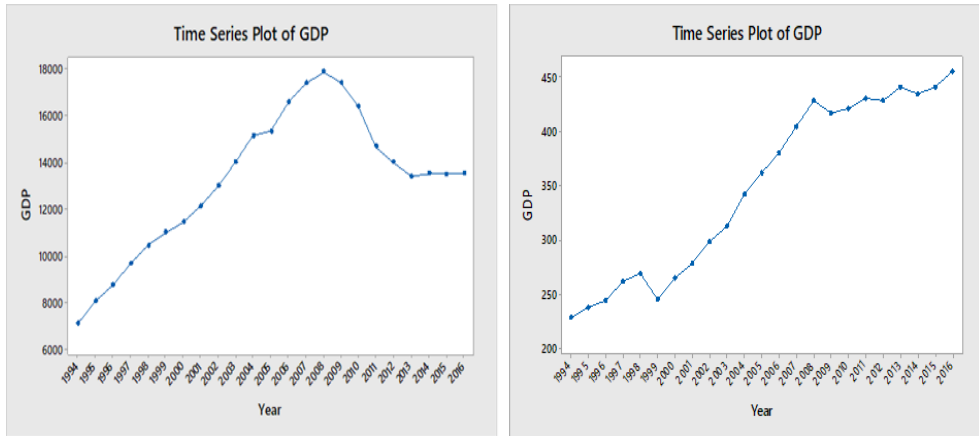
Food items selected for analysis included bread and bakery, flour and pasta, rice, fresh meat, meat products, fresh fish, fish products, eggs, milk, yogurt, white cheese, fresh fruit, processed fruit, fresh vegetables, processed vegetables, vegetable oil, animal fat, chocolate, cookies, biscuits. These items were grouped as follows: grains (i.e. bread, flour, and rice), meat (i.e. meat, meat products), milk (i.e. fresh milk, yogurt, cheese), vegetables (i.e. fresh vegetables, processed vegetables), fruits (i.e. fresh fruit, processed fruit), fats (i.e. oil, butter, margarine, lard), sweetened products (i.e. chocolate, cookies) and eggs. The data were calculated annually per capita and refers to the time frame of 1994-2016.

The autocorrelation plot was used to determine whether the time series were stationary or not. The appropriate autocorrelation plots showed that there were exist a trend in all the cases, both at Serbia and Greek time series. Thus, the appropriate model was fitted to create the forecasts for the next periods. All statistical analyses were conducted using Minitab statistical software.

Results

In Greece, we can observe that the upward trend of GDP seems to be halted in the year 2008, where it reached its peak, and after this year there is a downward trend until 2013, where it shows to be stabilized (Figure 1).

Figure 1. The evolution of the GDP in Greece (left) and Serbia (right)



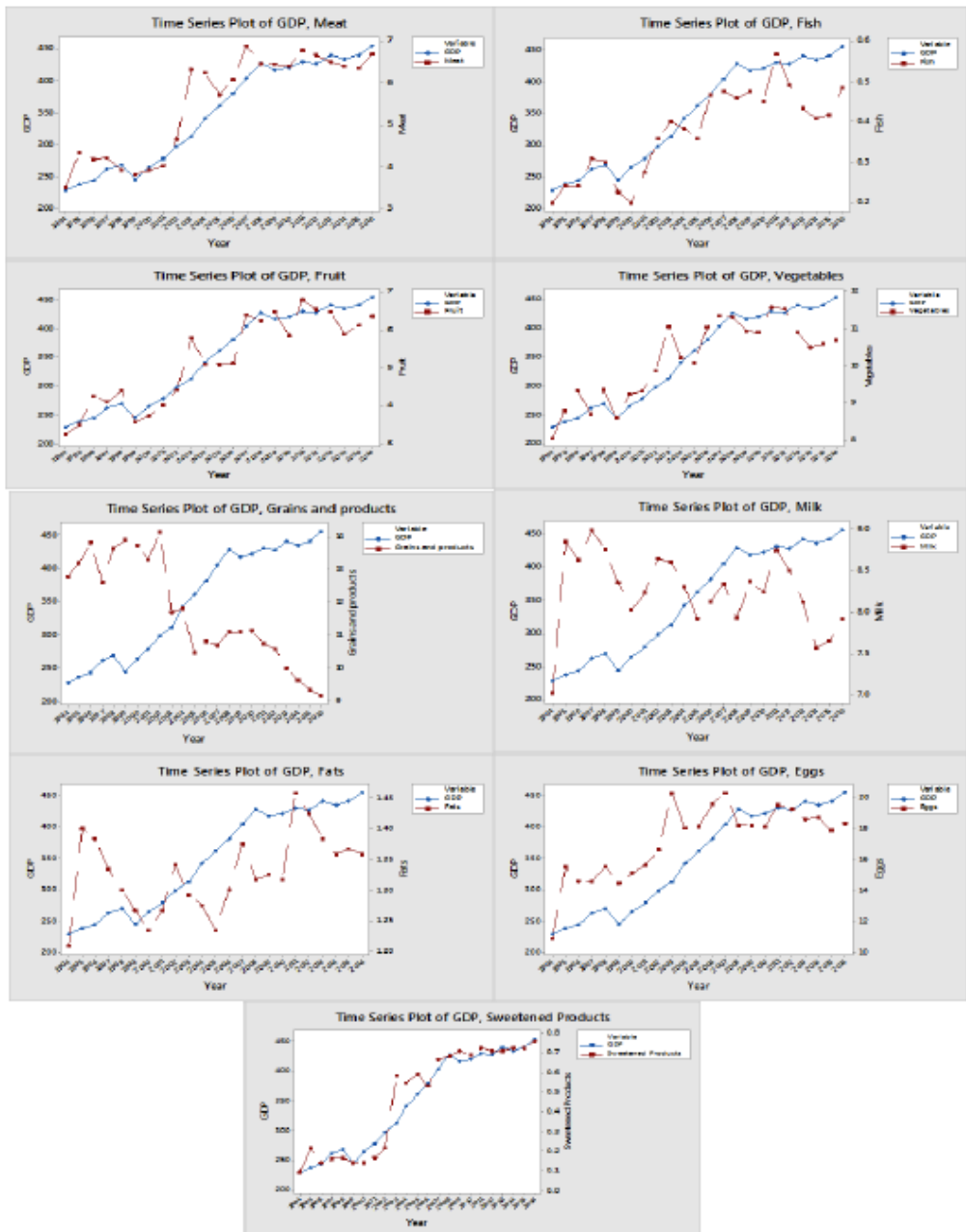
Source: Authors' calculation

Quite differently, the upward trend of GDP in Serbia can be observed until 1988, just before two years of the strong decline. After 2000 an upward trend in GDP has broken also in the year 2008, but recovery started very soon and, in the year 2011, it has outgrown the level reached in 2008. Figures 2 and 3 show the time series plot of the consumption of basic goods (in kilograms, except milk which is in liters and eggs which is the number of) compared to the time evolution of GDP in Serbia and Greece, respectively.

The numbers are referred to as the mean monthly consumption during the years 1994-2016. As could be seen from the time series plots (Figure 2) consumption of all food groups in Serbia, except grains, milk, and fats, increased by increasing GDP. This was valid until 2011 – after that period the food consumption did not correspond adequately with the increase of GDP. The issue is much clearer and more visible in the Greek case (Figure 3). The key feature of most of the time series plots is that the consumption of all the major goods is reduced about the same period in which there is a reduction of GDP. This could be explained by the fact that in this period (late 2008-2009) started in Greece the great economic crisis, which has changed dramatically many aspects of everyday life of the Greeks, one of which was the consumption of the basic foodstuffs.

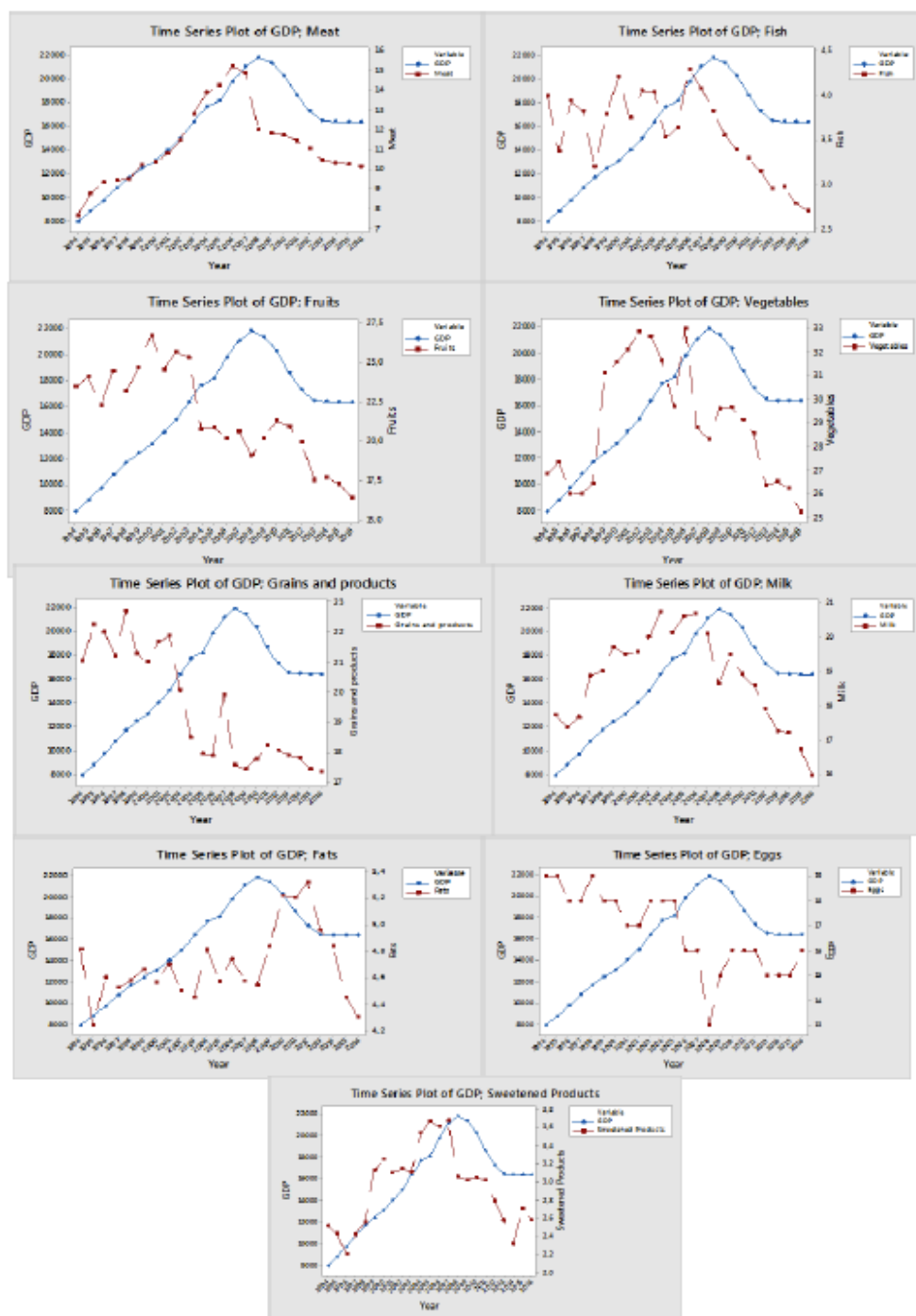
Subsequently, and taking into account the form of the initial time series, trend analysis and a forecast for the consumption of the majority food groups was applied, for both countries. These analyses are shown initially in Figures 4 and 5.

Figure 2. Relationship between GDP and food consumption in Serbia



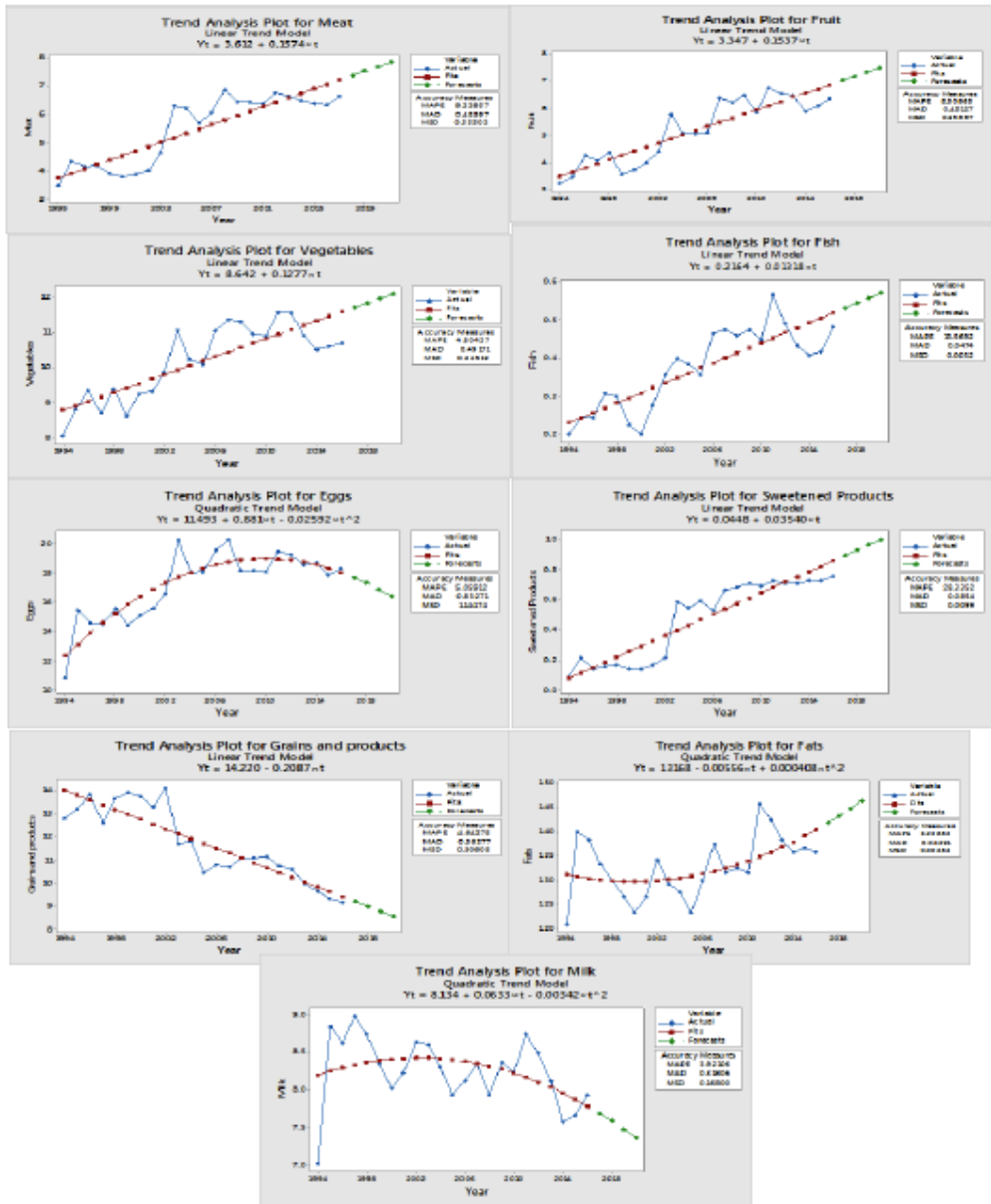
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Figure 3. Relationship between GDP and food consumption in Greece



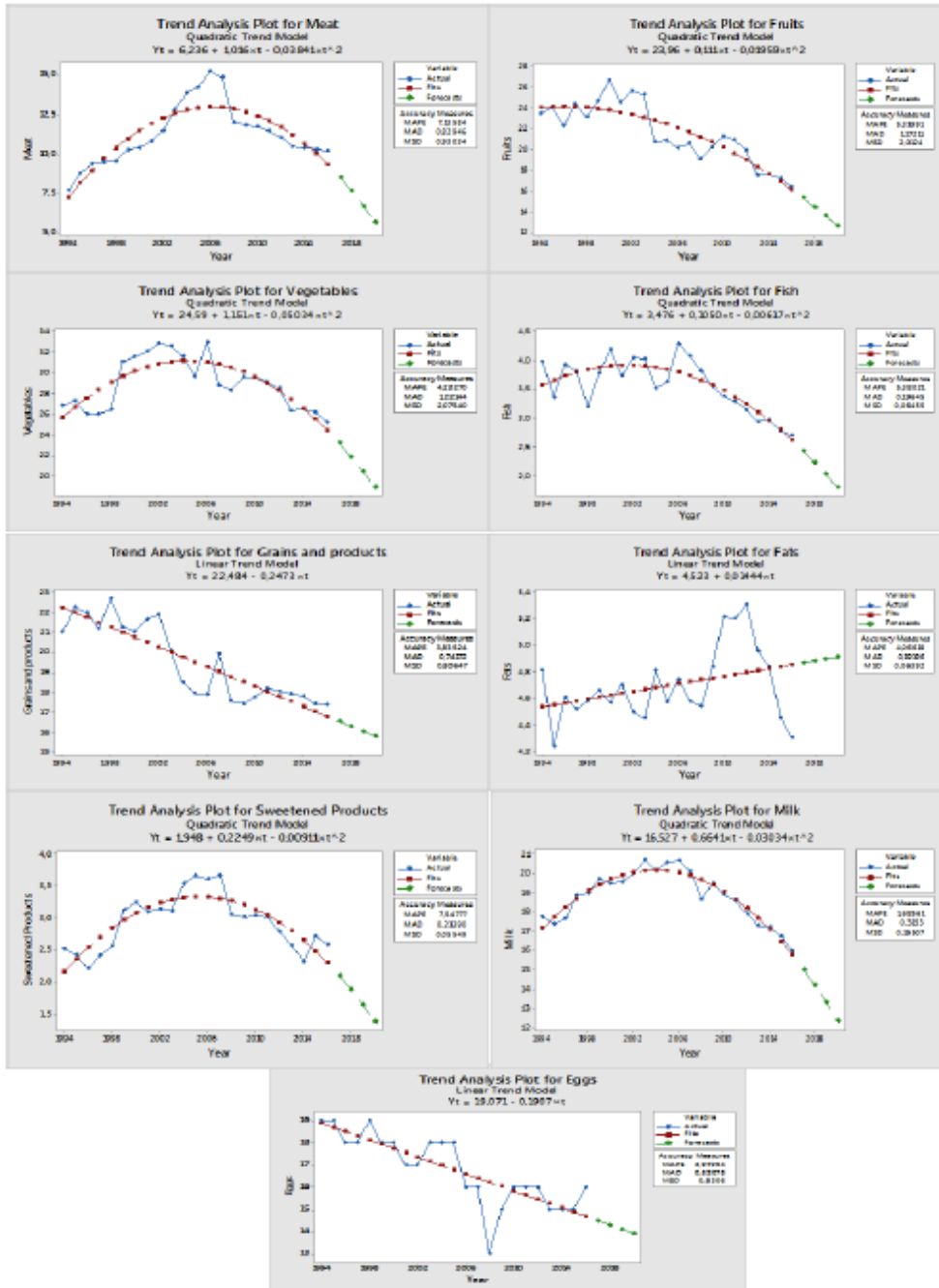
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Figure 4. Serbian trends in dietary patterns (average quantity consumed monthly per household member on y axis)



Source: Authors' calculation

Figure 5. Greek trends in dietary patterns (average quantity consumed monthly per household member on y axis)



Source: Authors' calculation

Moreover, to be more accurate, the exact forecast for the consumption of major food groups, for both countries, are presented in Tables 1 and 2. The forecast was made for four years, i.e. the years 2017 to 2020.

Table 1. Forecasts of the consumption of the basic products in Serbia, at a four years period (2017-2020) in monthly quantities on average, per household member (in kilograms except milk and eggs).

Consumption of the basic products									
Year	Meat	Fruits	Fish	Vegetables	Grains and products	Milk (in liters)	Fats	Eggs (pieces)	Sweetened Products
2017	7.389	7.035	0.533	11.707	9.211	7.683	1.418	17.708	0.894
2018	7.547	7.189	0.546	11.835	9.002	7.578	1.432	17.319	0.929
2019	7.704	7.343	0.559	11.962	8.793	7.467	1.448	16.879	0.965
2020	7.861	7.496	0.572	12.090	8.585	7.349	1.464	16.386	1.001

Source: Authors' calculation

Table 2. Forecasts of the consumption of the basic products in Greece, at a four years period (2017-2020) in monthly quantities on average, per household member (in kilograms except milk and eggs).

Consumption of the basic products									
Year	Meat	Fruits	Fish	Vegetables	Grains and products	Milk (in liters)	Fats	Eggs (pieces)	Sweetened Products
2017	8.500	15.335	2.441	23.220	16.548	14.988	4.869	14.494	2.097
2018	7.634	14.486	2.243	21.904	16.300	14.165	4.883	14.303	1.876
2019	6.692	13.598	2.033	20.488	16.053	13.283	4.898	14.112	1.636
2020	5.672	12.670	1.811	18.971	15.806	12.338	4.912	13.921	1.378

Source: Authors' calculation

The consumption of the majority of food groups - meat, fish, dairy, eggs, fruits, vegetables, and sweetened products - in Serbia increased during the observed period. A particularly large increase was reported for sweetened products (250%), fish (100%), and fruits (81.7%). Analysis of the data showed that there was a significant decrease in the consumption of grains (30.5%), while the overall consumption of fats and milk did not change. However, the overall consumption of the majority of food items in Serbia is much lower than in Greece. This trend will continue in the future also (Table 1-2). The exceptions can only be observed in the consumption of meat and eggs. It can be expected that Serbia will spend more meat and eggs per capita than in Greece shortly.

Simple linear regression analyses were used in Serbian and Greek data to determine the relationship between GDP and food consumption (Tables 3 and 4).

Table 3. Simple linear regression analyses to determine the relationship between GDP and food consumption in Serbia

<i>Independent: GDP pc</i>	R ² (%)	Adj R ² (%)	F	p	Regression equation
<i>Dependent variable</i>					
<i>Meat</i>	86.6	86.0	135.96	0.000	$y=7.863 + 0.1667x$
<i>Fruits</i>	88.8	88.3	166.96	0.000	$y=6.110 + 0.1611x$
<i>Vegetables</i>	78.1	77.1	75.03	0.000	$y= 74.37 + 0.1368x$
<i>Fish</i>	82.5	81.7	99.31	0.000	$y= -0.4646 + 0.01422x$
<i>Grains</i>	82.7	81.9	100.43	0.000	$y= 214.7 - 0.2126x$
<i>Fats</i>	21.7	18	5.83	0.025	$y= 14.40 + 0.004357x$
<i>Eggs</i>	63.5	61.7	36.46	0.000	$y= 111.8 + 0.2709x$
<i>Milk</i>	6.2	1.7	1.38	0.253	$y= 104.8 - 0.01675x$
<i>Sweetened products</i>	92.5	92.2	260.47	0.000	$y= - 7.215 + 0.03684x$

Source: Authors' calculation

Table 4. Simple linear regression analyses to determine the relationship between GDP and food consumption in Greece

<i>Independent: GDP pc</i>	R-sq (%)	R-sq (adj) (%)	F	p	Regression equation
<i>Dependent variable</i>					
<i>Meat</i>	60.45	58.57	32.10	0.000	$y = 5.40 + 0.000370x$
<i>Fruits</i>	28.97	25.28	8.56	0.029	$y = 27.71 + 0.000388x$
<i>Vegetables</i>	13.37	4.70	2.07	0.165	$y= 26.02 + 0.00186x$
<i>Fish</i>	12.10	3.31	0.17	0.687	$y = 3.734 + 0.00002x$
<i>Grains</i>	61.86	60.04	34.06	0.001	$y= 25.32 - 0.00369x$
<i>Fats</i>	12.14	7.96	2.90	0.948	$y= -4.325 + 0.00024 x$
<i>Eggs</i>	57.79	53.57	13.69	0.668	$y = 20.67 - 0.011x$
<i>Milk</i>	8.67	4.32	1.99	0.173	$y = 17.26 + 0.00098x$
<i>Sweetened products</i>	36.00	32.95	11.81	0.002	$y = 1.916 + 0.0065x$

Source: Authors' calculation

The analysis confirms previous expectations about the nutritional transition occurring in both developed and developing countries. But, in terms of calories arising from different major food commodities, large differences may be seen between the developing and developed countries. The overall consumption of foods in a developed country (Greece) is higher than in developing countries (Serbia). On a per-capita basis, the Greeks consume twice as much milk, fruits, and vegetables as the Serbs; they consume 3.5 times more fats and 4.5 times more fish. An exception that predicts that the Serbs will consume more meat and eggs shortly, can be explained by two facts. First, in

developed countries such as Greece, the consumption of particular food items must reach the ceiling at some point, followed by an imminent decline. Second, Serbia has traditionally been able to ensure self-sufficiency in meat production, especially in pork.

Discussions

The analysis showed (Table 3) that consumption of all food groups in Serbia - except milk- are significantly affected by the changes in the GDP. Meat, fish, eggs, fruit, vegetables, sweetened products are all positively correlated with GDP, while grains are only negatively correlated. The same analysis for Greece showed (Table 4) that only the consumption of meat, fruits, grains, and sweetened products is significantly affected by the changes in the GDP. GDP has a positive impact on the consumption of meat, fruits, and sweetened products, while GDP seems to have a negative effect on the consumption of grain products.

Although both countries have a long-standing culinary tradition, they have also its unique gastronomical tradition and coping with modernization trend by the promotion of traditional food (Barjolle *et al.*, 2015; Trichopoulou *et al.*, 2006). Serbian cuisine was created under influence of Greek, Turkish and Hungarian cuisine. A lot of food items is homemade including: jams, pickled food, *kajmak* (clotted cream), milk cheeses, *ajvar* (eggplant and peper relish), *rakija* (fruit brendy), soups etc. Also, each region having its traditional dishes. Generally, Serbs are consuming a lot of processed meat such as *meze* (an assortment of small dishes and appetizers, slices of cured meats and sausages). Greeks adopt the Mediterranean diet, with some typical products such as wild plants, figs stuffed with walnuts (Simopoulos, 2001), feta, Greek salad etc. This kind of diet implies plenty of fruits and vegetables, olive oil, whole grains, and seafood. Therefore, differences in food patterns between two countries cannot be explained just by a large difference in GDP. An important role, certainly played - tradition. However, no doubt, the economic collapse of Serbia has caused great consequences and increased poverty in this country. This article foreseen that years would pass before fruits, vegetables, fish, and fats consumption in Serbia reaches a Greek level.

Conclusions

A reference should be done to the two events that decisively influenced the two countries, namely the bombings that took place in Serbia and the economic crisis facing Greece in recent years. For Serbia is concerned, there seems to be a strong tendency to increase food consumption in all categories, since the country is getting far away from that time. While in Greece the prolonged economic crisis seems to be causing a reduction in food consumption.

Consumption of food categories is influenced to some extent by other factors. In any case, the resumption of research in the future may give us a fuller picture of the evolution of food consumption in the two countries as they interact with the economic issues, the tradition of the two peoples and the evolution of consumer preferences.

These results, the first of their sort to be estimated for Serbia, could be used for policy purposes, especially to assess the implications of obligations that the Republic of Serbia undertake through the Stabilization and Association Agreement (SAA) with the European Union (EU).

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Conflict of interests

The authors declare no conflict of interest.

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