ASSESSMENT OF FOOD CONSUMPTION DIVERSITY FOR ROMANIAN HOUSEHOLDS

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Abstract: *The aim of this paper is the identification of economic and socio-demographic factors influencing food consumption diversity on the Romanian households. We use the Household Budget Survey for two quarters of the year 2011. The survey contains detailed information on the demographic variables of the household like the household members' age, educational level, occupational status as well as information on the income and consumption in the month of the interview. We have looked at two measures of diversity: first the count measure (CM), in which the number of food products consumed by the household are added and the second diversity measure is the transformed Berry Index (TBI). As conclusion, we found that low income has a negative influence to food diversity demand and induce a negative influence in food commodity markets. The residence area is also important for the household diet, as the rural households have a less diversified food diet.*

Key words*: food and nutritional security, food diversity, transformed Berry index, household level, Romania*

INTRODUCTION

The investigation of the relation between the amount of consumed food and the economic and socio-demographic characteristics of households, such as the household members' income, household size, composition and household head's educational level represent the common pattern in the investigation of food demand. At the same time, too little focus is laid on certain qualitative aspects in relation to the consumption behaviour, such as number of foodstuffs consumed in a certain period, in other words the dietary variety or diversity. Food consumption diversity is important from several points of view. In the first place, a most diversified diet is a modality to protect ourselves against certain diseases. In this respect, the nutritionists' opinion is that an optimum diet should contain the highest possible number of food products. In order to measure dietary diversity, the US Department of Agriculture developed the Healthy Eating Index (HEI). This index contains 12 components, out of which 9 components measure diet adequacy and 3 components refer to moderation in food consumption [2]. Another index for dietary diversity evaluation, used by FAO, is HDDS (Household Dietary Diversity Score), which is calculated by counting the type of consumed foodstuffs selected from 12 main groups: 1.Cereals, 2. Edible roots and tubers, 3. Vegetables, 4.Fruit, 5. Meat, poultry, offal, 6. Eggs, 7. Fish and seafood, 8. Legumes, beans, nuts, 9. Milk and dairy products, 10. Oils and fats, 11. Sugar and honey, 12. Miscellaneous [3].

Knowing the modality of dietary diversity evolution in relation to certain factors is also important for the marketing studies, for adapting the strategies to consumers' needs. At the same time, the increase of food consumption diversity in certain geographic areas has important implications upon the world and regional agri-food trade and upon the economic development in general [4].

MATERIALS AND METHODS

We use the Household Budget Survey for two quarters of the year 2011. The survey contains detailed information regarding the composition of the household like the household members' age, educational level, occupational status, etc. as well as information regarding the consumption and income in the month of the interview. The survey contains approximately 100 records for food expenditure, and this is the information that is used for computing the diversity measures described above. We use two measures for food diversity, firstly the count measure (CM) and secondly a transformed Berry Index (TBI)

$$TBI = \ln\left(\frac{BI}{1 - BI}\right)$$

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

where BI is Berry index and w_i is the share of product i in total food expenditures of the household.

Table 1 presents the values of the CM, BI and TBI for the two samples.

Table 1.

The statistics of the CM, BI and TBI

Variable	*Obs*	*Mean*	*Std. Dev.*	*Min*	*Max*
First quarter					
CM	7843	22.50249	9.816804	1	60
BI	7843	0.88761	0.079188	0	0.97157
TBI	7835	2.2217	0.607214	-1.17966	3.531456
Third quarter					
CM	7724	24.41196	10.29228	2	62
BI	7724	0.889837	0.07757	0	0.971117
TBI	7715	2.236487	0.626178	-15.9424	3.515186

Source: Authors' computations

The main objectives for this study are:

- Identification of demographic factors that influence the food diversity of households;
- Assessment of income elasticity for diversity for different types of households;
- Evaluation of seasonality effects upon food diversity.

RESEARCH RESULTS

The employed diversity measures do not appear to be very different in the two analyzed samples. In summer, households averagely consume two more food products compared to winter, according to the CM measures. The differences measured by BI and TBI are not so large. The fact that the average food diversity measures do not appear to be very different in the two quarters does not mean that the determinants of food diversity are

similar in the winter and in the autumn sample. In order to test that we had run the estimation for the two different samples.

The equations estimated have as dependent variable the count measure (CM) and the transformed Berry Index (TBI), the explanatory variables used being: the logarithm of the household income, in order to assess the elasticity of the diversity with respect to income, information regarding the household composition, the characteristics of the household head, also including information on the residence area. The household composition variables are the number of household members and the number of children. The household characteristics that were included in the equation were age, education, and occupational status. In terms of residence, we have included a dummy for the urban households, the county of residence. In addition, the education of the household head was interacted with the residence area (urban/rural) in order to assess whether educated/uneducated urban households made different choices in terms of diversity in comparison to educated/uneducated rural households. In the specifications we have included information on the characteristics of the second household member, but they did not seem to have an effect on food diversity

The results for CM, presented in Table 2, indicate that there are some important differences in the food diversity in the first quarter compared to the third quarter. There is some indication of the fact that the diversity in the third quarter is higher because the constant in the regression is significant higher in the summer data compared to the winter one (1.65 versus 1.08). On the other hand, the diversity is more elastic with respect to income in winter than in summer (0.21 versus 0.15). This means that an equal increase in income would bring a larger increase in diversity in the winter months. A female household head is associated to higher diversity, but the effect is stronger in the first quarter. In summer months the urban households have higher food diversity than rural households, but probably due to self-consumption of agricultural production. If the household head is self-employed in agriculture, there are some effects on food diversity which is lower in this case, again the effect is more pronounced in the third quarter. The other occupation status does not appear to have significant effects on the count measure of diversity. The age of the household head has a larger influence in the third quarter, older households appear to favour a more diverse food diet. Larger households, especially households with children have a larger number of purchased foods items, probably due to the fact that they have to take into consideration the different preferences of the household members.

The results for TBI, presented in Table 3 are not very different from the results of the count measure. The income elasticity is somewhat larger 0.23 in the first quarter and 0.17 in the third quarter, but the same difference between the influence of income from one quarter to the other can be noticed. A female household head has a positive influence on the TBI measure as well as the CM. The education level in the case of urban households is important in the determination of TBI diversity. It appears that no education for the household heads means less diversity. There is no indication that more educated household head means more diversity, but there are certain levels of education that seem to be associated with higher TBI diversity (vocational education). The occupational status of the household head is important as well. Self-employment in agriculture decreases diversity in the third quarter only, and housewives are associated with lower diversity of food. Household composition greatly affects the TBI diversity, the increase in the number of members decreases diversity (with the CM the effect was reversed) but if the members are children, they increase diversity (similar to the CM measure).

Table 2

The estimation regression of the count measure (CM) of diversity

CM	First quarter		Third quarter	
Number of obs	7816		7712	
F(111, 7704)	68.02		80.33	
Prob > F	0		0	
R-squared	0.4949		0.5282	
Adj R-squared	0.4877		0.5217	
Root MSE	0.3627		0.33099	
	Coef	Prob	Coef	Prob
Logarithm of the income variable	0.2146028	0.00	0.1545835	0.00
Female	0.0694881	0.00	0.0277885	0.01
Urban Households	0.0210242	0.91	0.2424988	0.04
Education level of the rural household head, omitted category is no education				
Primary school	-0.02085	0.72	-0.125979	0.01
Secondary school	0.0445853	0.44	-0.074055	0.10
Vocational education	0.0628792	0.28	-0.050153	0.28
First two years of high school	-0.044295	0.51	-0.05282	0.35
High school	0.1038931	0.09	0.0122738	0.80
Post high school schooling	0.0751407	0.29	0.001783	0.98
Short term university degree	-0.049674	0.60	0.0428629	0.58
University degree	0.1132328	0.14	-0.068843	0.27
Doctoral studies	-0.430562	0.24	(dropped)	
Education level of the urban households, omitted category is no education				
Primary school	0.322466	0.09	0.1138331	0.35
Secondary school	0.3061443	0.11	0.1524385	0.21
Vocational education	0.3150608	0.10	0.1571704	0.19
First two years of high school	0.3486687	0.08	0.155783	0.25
High school	0.262235	0.17	0.1111491	0.36
Post high school schooling	0.3045114	0.12	0.1188861	0.35
Short -term university degree	0.4090966	0.05	0.07975	0.57
University degree	0.2240449	0.26	0.1617001	0.21
Doctoral studies	0.6389457	0.14	0.0624542	0.71
Occupational status of the household head, omitted category is wage earner				
Patron	0.1154808	0.16	-0.070168	0.35
Self-employed in non-agricultural activities	0.0214165	0.38	0.008113	0.72
Member in a non-agriculture coop	0.1985292	0.28	0.1575916	0.50
Self-employed in agricultural activities	-0.041645	0.04	-0.102833	0.00
Member in an agriculture coop	-0.003058	0.99	0.0918494	0.63
Unemployed	-0.013193	0.57	0.0106291	0.69
Pensioner	0.0285006	0.10	0.0218476	0.16
Pupil	-0.285331	0.02	-0.417898	0.21
Student	-0.321905	0.00	0.0065028	0.94
Housewife	-0.047966	0.38	-0.080185	0.17
The age of the household head, omitted category is less than 30 years				
between 30 and 39	0.0666624	0.02	0.0360162	0.19

between 40 and 49	0.0280752	0.33	0.0540383	0.05
between 50 and 59	0.021192	0.47	0.0856898	0.00
over 60	-0.002463	0.93	0.0580932	0.03
Number of household members, omitted category is one member				
2 members	0.0548548	0.00	0.0656865	0.00
3 members	0.0371104	0.06	0.0478313	0.01
4 members	0.0289203	0.24	0.0553757	0.02
5 members	0.0488784	0.15	0.051412	0.10
6 members	0.0626092	0.19	-0.023567	0.58
7 members	-0.026001	0.73	-0.085232	0.17
Number of children, omitted category is no child				
1 child	0.1311985	0.00	0.1012279	0.00
2 children	0.1701286	0.00	0.1261402	0.00
3 children	0.2670834	0.00	0.1018566	0.02
4 children	0.1573811	0.08	0.0916415	0.19
5 children	0.2424217	0.04	0.1959654	0.09

Source: Authors' computations

Table 3

The estimation regression of the TBI measure of diversity

TBI	**First quarter**		**Third quarter**	
Number of obs	7808		7703	
F(111, 7704)	47.7		43	
Prob > F	0		0	
R-squared	0.4076		0.375	
Adj R-squared	0.399		0.3663	
Root MSE	0.46941		0.49867	
	Coef	**Prob**	**Coef**	**Prob**
Logarithm of income	**0.234934**	0.00	**0.177076**	0.00
Female	**0.068747**	0.00	**0.059661**	0.00
Urban household	-0.15106	0.54	0.061493	0.73
Education level of the rural household head, omitted category is no education				
Primary school	-0.06234	0.40	**-0.1459**	0.03
Secondary school	-0.05021	0.50	-0.10929	0.11
Vocational education	-0.03973	0.60	-0.07686	0.27
First two years of high school	-0.09088	0.30	-0.04797	0.57
High school	0.039272	0.61	-0.01239	0.87
Post high school schooling	0.008172	0.93	-0.00077	0.99
Short term university degree	0.005787	0.96	0.005808	0.96
University degree	0.156606	0.11	-0.0088	0.93
Doctoral studies	-0.12009	0.80	(dropped)	
Education level of the urban households, omitted category is no education				
Primary school	0.475731	0.06	0.312615	0.09
Secondary school	**0.53855**	0.03	**0.365309**	0.05
Vocational education	**0.573263**	0.02	**0.393096**	0.03
First two years of high school	**0.539452**	0.04	0.351024	0.08
High school	**0.497585**	0.05	**0.363892**	0.05

Post high school schooling	**0.516825**	0.04	0.312697	0.11
Short term university degree	0.494392	0.07	0.386228	0.07
University degree	0.385081	0.13	0.336982	0.08
Doctoral studies	0.567561	0.32	0.108451	0.67
Occupational status of the household head, omitted category is wage earner				
Patron	0.232364	0.03	-0.01063	0.93
Self-employed in non-agricultural activities	-0.01598	0.61	0.010921	0.75
Member in a non-agriculture coop	0.162339	0.49	0.047104	0.89
Self-employed in agricultural activities	-0.02329	0.37	**-0.11597**	0.00
Member in an agriculture coop	-0.09906	0.77	-0.07418	0.80
Unemployed	-0.0412	0.17	-0.02565	0.52
Pensioner	0.035886	0.11	-0.00929	0.69
Pupil	**-0.38204**	0.02	-0.59915	0.23
Student	**-0.34258**	0.00	0.136427	0.26
Housewife	**-0.14902**	0.03	**-0.18188**	0.04
The age of the household head, omitted category is less than 30 years				
between 30 and 39	0.053812	0.16	0.051509	0.22
between 40 and 49	-0.00039	0.99	0.060224	0.14
between 50 and 59	-0.00828	0.83	**0.104699**	0.01
over 60	-0.04141	0.26	**0.099179**	0.01
Number of household members, omitted category is one member				
2 members	**-0.10233**	0.00	**-0.03313**	0.07
3 members	**-0.22185**	0.00	**-0.14897**	0.00
4 members	**-0.29489**	0.00	**-0.24723**	0.00
5 members	**-0.33321**	0.00	**-0.3394**	0.00
6 members	**-0.40882**	0.00	**-0.37277**	0.00
7 members	**-0.58347**	0.00	**-0.55075**	0.00
Number of children, omitted category is no child				
1 child	**0.146454**	0.00	**0.123154**	0.00
2 children	**0.193642**	0.00	**0.185923**	0.00
3 children	**0.282483**	0.00	**0.156182**	0.01
4 children	**0.338271**	0.00	0.075343	0.47
5 children	**0.388104**	0.01	**0.495866**	0.00

Source: Authors' computations

The importance of income and residence area as explanatory variables of food diversity is also revealed by the descriptive statistics based on the data from the first half of the year 2011. In this way, low income at household level make an important part of foodstuffs to be produced on their own household and the consumption of bought dietary food to be at a lower level. This aspect is noticeable in Romania, where the rural households have a much lower dietary diversity compared to the urban households (Figure 1).

It is important to mention that the households that have a high dietary diversity, measured by Berry index, for which the index values are higher than 0.90, account for 68% of the urban households and only 36% of the rural households. The rural households have a moderate dietary diversity, most of them (47%) being in the interval (0.80, 0.90) for the Berry Index. The higher food diversity in the case of urban households in comparison with rural households represents an indirect effect of income disparities between the households

from the urban and rural areas. Thus, in 2011, according to the Budget Household Survey [5], urban households had total and cash income higher by 23%, and respectively by 73% compared to rural households. In addition to the income factor, other factors that influence consumer behaviour and dietary diversity could be considered, including some demographic factors that have been already mentioned. In addition, the access to food retail systems and to the transport infrastructure may also influence the behaviour of consumers from different residence areas.

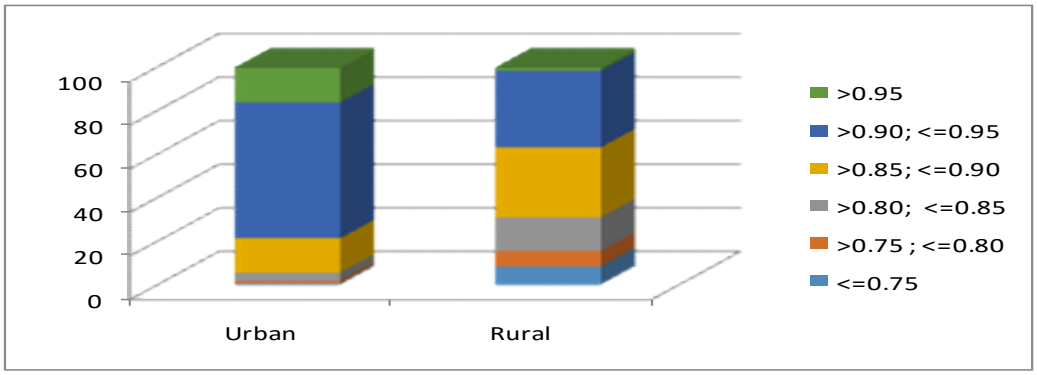

Fig. 1. Distribution (%) of urban and rural households by Berry Index, in the first quarter of 2011

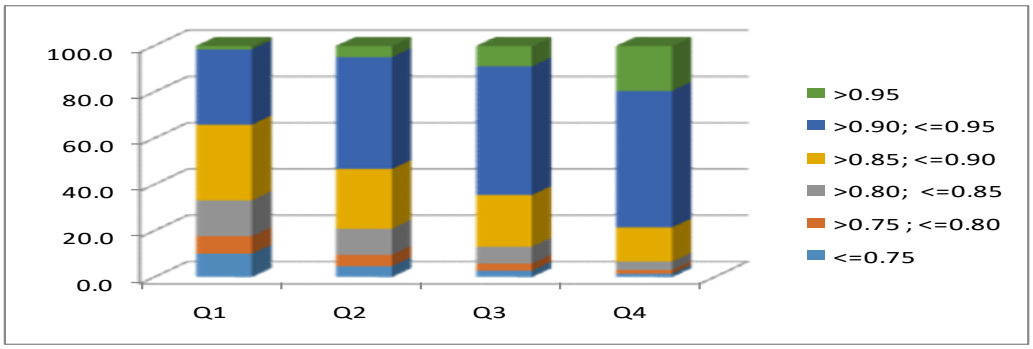

Fig.2. Distribution (%) of households by Berry Index and income quartiles, in the first quarter of 2011

In this context, our results with regard to household food diet diversity in relation to disposable income fully confirm the economic theory, i.e. a direct link between income growth and diversity of diets [1]. Figure 2 shows that the households from first income quartile are characterized by a medium to low dietary diversity with only 34% of these having a high diversity, for which the Berry Index is higher than 0.90. In the fourth income quartile, more than 78% of households have a high dietary diversity (BI>0.90), and 20% have a very high diversity, for which the Berry Index is higher than 0.95. At the same time, the number of households that fall into the high food diversity category increases with incomes, which indicates a consistent statistical relation between income and dietary diversity.

CONCLUSIONS

The investigation of the food diversity in different socio-economic and demographic categories of the population is important for the quality of food consumption, for the identification of vulnerable categories and for the nutrition programs.

Low income, which has a negative influence to food diversity demand induces a negative influence in food commodity markets.

The residence area is also important for the household diet, as the rural households have a less diversified food diet, due to lower incomes and to the high share of self-produced food and subsistence economy.

At the same time, the investigation of the variety of consumption provides important elements for the food marketing.

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