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AN EMPIRICAL INVESTIGATION OF THE DETERMINANTS OF FOOD WASTE GENERATION IN URBAN AREA AT HOUSEHOLD LEVEL IN ALBANIA

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Abstract

Economically avoidable food losses have a direct and negative impact on the incomes of both farmers and consumers. Given that many smallholders live on the margins of food insecurity, a reduction in food losses would have an immediate and significant impact on their livelihoods. For poor consumers, food insecure or at-risk households, the priority is clearly to have access to food products that are nutritious, safe and affordable. Improving the efficiency of the food supply chain could help to bring down the cost of the food to the consumer and thus increase access. The present study deals with approaches for preventing food waste based on a thorough analysis of the scale, reasons and pattern of food wastage in urban area in Albania. The study is the first empirical piece of research focused on Albanian households' food waste behavior. The research scope includes not only what households discard in terms of amounts and waste

structure, but also as an evaluation of the possible determinants for the wasteful behavior. Evidence reveals that Albanian consumers have a significant food waster self-identity and consistent post-shopping routines which lead to a reduction in the reported food waste.

Keywords: food waste, food insecurity, discard, consumer, Albania, households, values

INTRODUCTION

Food waste in this paper refers to food items intended for human consumption, which have been discarded by the consumer, while edible food waste is defined as the amount of discarded food and drinks that could have been consumed, but was discarded. Food waste is thus the sum of edible and non-edible food waste. It is also important to point out that food products intended for other uses, for example for animals, biofuels and biomaterial are not included in this definition. The subject of food waste is a multidimensional issue related to several social, economic, and environmental aspects. The economic impact of food waste on households, is that food costs money, and by consuming a larger portion of the food bought, families can save money. The social perspective roots in the reality of food being a scarce resource and like other scarce resources it can be reallocated to the parts of the world that have food shortages. Wasting food means losing not only life-supporting nutrients, but also scarce resources like land, water, and energy that were expended in the production, processing and distribution of food. These losses will be exacerbated by future population growth combined with changing dietary habits. Due to increasing prosperity in developing countries, the per capita caloric intake from meat consumption is assumed to rise in mid-century. The production of animal-derived products requires considerably more resources than the production of grain-based food. Reducing the current level of food wastes, offers us a significant opportunity for diminishing environmental risks and conserving finite resources that could be utilized for other human activities.

Background

In view of the different types and causes of food losses along the supply chain some authors (Waartset al.2011) distinguish between food losses and food waste. Following this distinction, food losses take place at the earlier stages of the food supply chain, during cultivation, harvesting, post-harvest treatment and processing, while losses occurring at the end of the food chain, during retail and final consumption are referred to as food waste. Thus, food waste is related to human behavior and is seen as a result of decisions made by businesses,

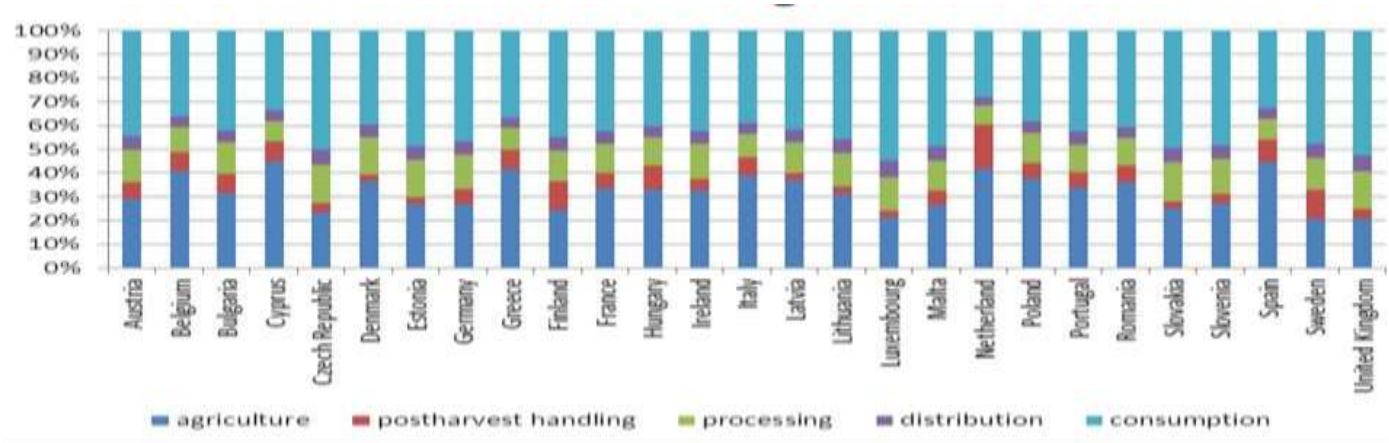
governments and individual consumers (Bloom 2010). Other authors (Quested & Johnson 2009) make a further differentiation and distinguish between avoidable, possibly/partially avoidable and unavoidable food waste: Avoidable food waste: products that are still suitable for human consumption at the time of discarding or products that would have been edible if they had been eaten on time; Possibly/partially avoidable food waste: products or ingredients which are not consumed due to consumer preferences (e.g. bread crusts, apple skins), or that can be eaten when food is prepared in one way but not in another (the skin of fried poultry is usually eaten, the skin of boiled poultry normally not). This category also covers leftovers in canteens or restaurants as a mixture of avoidable and unavoidable waste; Unavoidable food waste: products or ingredients which are not suited for human consumption in accordance with today's food standards. This encompasses non-edible components (e.g. banana peels, bones, egg shells), as well as products that are so damaged due to weather, diseases or pests and cannot be consumed.

Table 1: Total amount of food waste (in 1000 tons) share of the individual stages of the supply chain across EU-27 in 2006

	Total amount of food waste	Specific amount of food	Agricultural production	Post harvest handling and storage	Processing and Packaging	Distribution	Consumption
	1000 tons	kg/capita	Share of the individual stages (%)				
EU-27	138 019.4	279.8	34.2	7.5	12.0	5.1	41,2

Source: Eurostat 2008

Graph.1: Share of different stages of food chain on total food waste generation



Source: Eurostat 2008

METHODOLOGY

In total, 350 fully completed questionnaires were collected during the data collection process. The number of respondents is sufficient to generate a sample with a good statistical power. As (Tabachnick and Fidell 2007) explain, when regression analysis is applied, the minimum sample size can be determined by the formula: 50+5*m, where m is the number of independent variables. As it can be seen later, the total number of independent variables (composite variables + demographic ones) is 23, which results in a required minimum of 165 respondents. In order to construct a quota sample, several steps are to be implemented in the data collection process: 1) The population is divided in specific groups; 2) A quota is calculated for each of the groups based on the available data; 3) The number of cases which are required for each quota is chosen; 4) All the data is combined, so that the full sample is provided (Saunders et al., 2009). The choice of quota sampling is justified by the number of advantages that it provides over the probabilistic techniques. In general, it is less costly and can be implemented quickly. Moreover, quota sampling does not require sampling framework and it works well with large sample sizes (Saunders et al.,2009).For the purposes of this study, the main objective was to construct a sample that matched the population in terms of age distribution. If age is represented by the sample accurately, it can also be suggested that the characteristics of the remaining population included in the survey (household size, number of children, income and education) are to be relatively well matched, as well. It should be also clarified that respondents aged 70+ are excluded from the analysis. Limiting the focus on the households comprised by individuals within the age boundaries of 18-70 is suggested to produce more relevant and accurate data that objectively reflects the existing reality.

Table 2: Population and sample characteristics

	Sample		Urban Population	
Age group	Nr	%	Nr	%
18-25	75	23	297365	24
25-35	59	18	238973	19
35-45	68	20	201366	16
45-55	75	22	241605	20
55-65	44	13	192918	16
65-70	14	4	62157	5
Total	335	100	1234384	100

Source: National Statistical Institute and authors calculations

Aim and objectives of the study

This study aims to investigate the food waste issue in Albania. We aim at understanding this issue at household level by identifying a number of main factors affecting food wasting. Our hypothesis is that people's attitudes, individual behavior and family typology may influence the quantity of food waste at household level.

Delimitations

There are few aspects of the food waste problem which cause certain limitations while investigating the issue in its depth. One of the significant obstacles for fully revealing the food waste problem originates from the complexity of the food production/distribution/consumption chains. Another potential limitation of the current study is the complete lack of statistical data about the food waste in Albania considering the fact that, no previous research has been done on the topic in local context. This poses serious limitations in understanding the prevailing food practices of the Albanian consumers, as well as a lack of punctuality in assessing the magnitude of the food waste problem in the country. The implementation of household surveys is methodically simple, but usually it can provide only qualitative information, because quantitative estimates out of memory regarding the weight of the food purchased and discarded are very prone to error (Schneider 2008). Experience also teaches that consumers substantially underestimate their losses when self-reporting (Beretta et al. 2013).

ANALYSIS AND RESULTS

The models are estimated using SPSS 23 and STATGRAPHICS Centurion. Several methods analysis are used as principal component analysis, analysis of variance, regression etc.

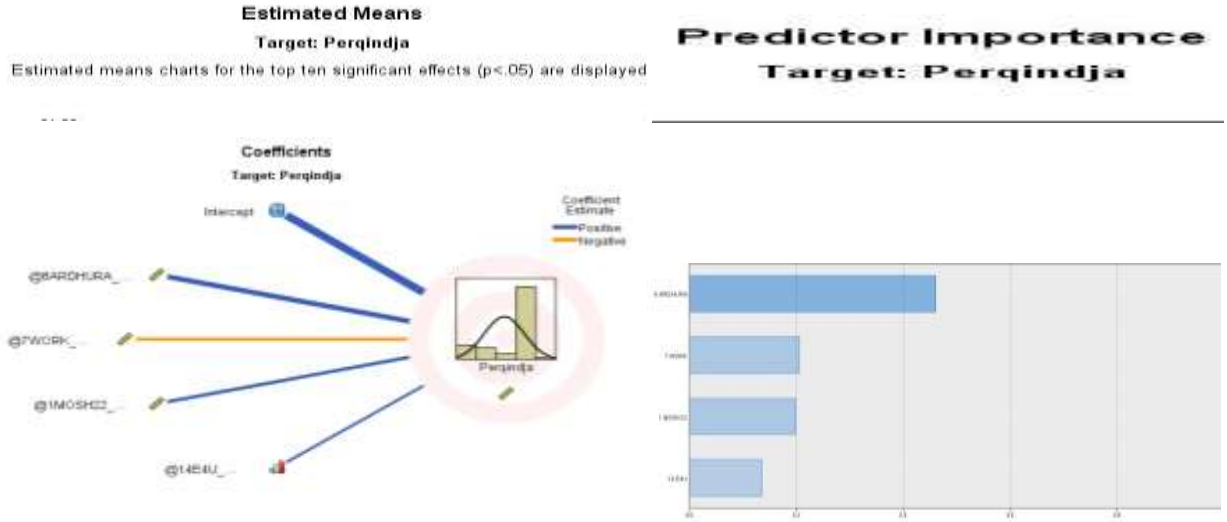
Table 3: Variables

Age	Eucation	Residential	Zone	Family Type	Immigrants	Working	Income	Inrow Interest	Food Value	FoodPercent	FruitType
X1	X2	X3	X4	X5	X6	X7	X8	Y10	Y1	Y2	F

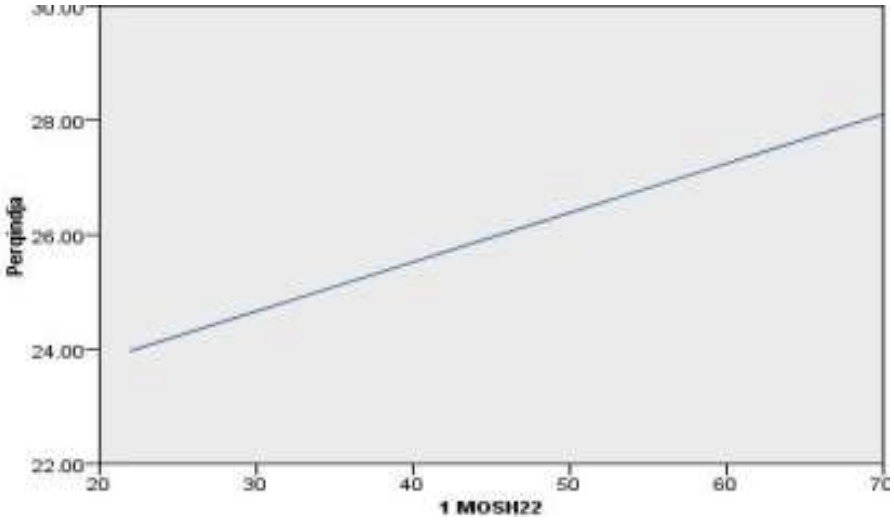
VegetType	Throw	THrowFreq	BuyFreq	Cooker	ThrowQuant	Why Throw	Waste Use	WasteQuantOrdin	THrowValue	PercentThrow
V	Y11	Y3	Y12	DA	Y4	Y5	Y6	Y7	Y8	Y9

Zone	Immigr	Throw	Cooker	WhyThrow
a=Bllok	0=No	0= No	0=Mother	1=Buy too much
b=Tr Re,M.Shyri Rr El	1=Yes	1= Yes	1-Other	0= Other
c=Other				

Graph 2: Percent of food waste, Predictor importance



Graph 4: Age wise percent



Graph 5: No. of workers wise percent

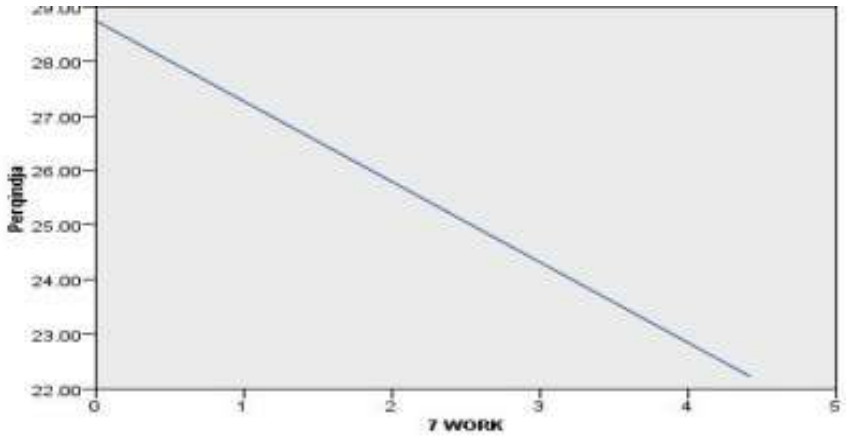


Table 4: Y1Analysis of Variance for Y1 - Type III Sums of Squares

Source	Sum of Squares	Df	Mean Square	F-Ratio	P-Value
COVARIATES					
X8	5.39732E6	1	5.39732E6	30.21	0.0000
MAIN EFFECTS					
A:X3	1.71573E6	4	428933.	2.40	0.0499
B:X5	3.2249E6	6	537484.	3.01	0.0071
C:X6	1.39139E6	2	695695.	3.89	0.0213
RESIDUAL	5.68088E7	318	178644.		
TOTAL (CORRECTED)	6.84842E7	331			

Table 5: Factor Analysis

Factor Number	*Eigenvalue*	*Percent of Variance*	*Cumulative Percentage*
1	2.61969	43.662	43.662
2	0.900327	15.005	58.667
3	0.814204	13.570	72.237
4	0.75073	12.512	84.749
5	0.496164	8.269	93.019
6	0.418882	6.981	100.000

Table 6: Factor Score Coefficients

	Factor
	1
Y1	0.782927
Y2	0.448148
Y4	0.563071
Y7	0.523762
Y8	0.809535
Y9	0.74777

Table 7: Least Squares Means for Y1 with 95.0% Confidence Intervals

Level	Count	Mean	Stnd. Error	Lower Limit	Upper Limit
GRAND MEAN	332	605.257			
X3					
4	1	559.399	466.306	-358.037	1476.84
A	129	674.619	153.855	371.917	977.322
B	138	685.832	149.836	391.037	980.628
C	18	641.384	179.077	289.057	993.711
D	46	465.05	161.766	146.782	783.318
X5					
1	18	879.632	202.888	480.46	1278.8
2	45	681.568	186.596	314.449	1048.69
3	51	515.884	186.126	149.69	882.078
4	128	496.223	180.278	141.533	850.912
5	69	568.073	183.023	207.984	928.163
6	18	413.836	174.319	70.8704	756.801
7	3	681.583	302.163	87.0905	1276.08
X6					
0	245	733.164	98.6597	539.055	927.272
1	86	582.284	100.369	384.812	779.756
2	1	500.323	450.178	-385.383	1386.03

Table 8: Y1 Dependent variable: OLS, using observations 1-335 (n = 332)

Dependent variable: Y1

	Coefficient	Std. Error	t-ratio	p-value	
const	865.93	100.548	8.6121	<0.00001	***
X8	0.0022594	0.0003856	5.8594	<0.00001	***
X3	-60.045	24.0693	-2.4947	0.01310	**
X5	-57.0926	19.215	-2.9712	0.00319	***
X6	-124.995	52.7234	-2.3708	0.01833	**

Mean dependent var	688.2530	S.D. dependent var	454.8636
Sum squared resid	59087159	S.E. of regression	425.0820
R-squared	0.137215	Adjusted R-squared	0.126661
F(4, 327)	13.00125	P-value(F)	7.76e-10
Log-likelihood	-2477.926	Akaike criterion	4965.852
Schwarz criterion	4984.878	Hannan-Quinn	4973.440

Table 9: OLS, using observations 1-335 (n = 329)

Dependent variable: Y4

	Coefficient	Std. Error	t-ratio	p-value	
Const	337.885	126.52	2.6706	0.00795	***
X8	0.00287088	0.000478176	6.0038	<0.00001	***
X3	-66.9254	30.2736	-2.2107	0.02775	**
X5	63.7413	23.8797	2.6693	0.00798	***

Mean dependent var	683.1307	S.D. dependent var	568.1159
Sum squared resid	90211550	S.E. of regression	526.8529
R-squared	0.147853	Adjusted R-squared	0.139987
F(3, 325)	18.79658	P-value(F)	2.88e-11
Log-likelihood	-2526.636	Akaike criterion	5061.271
Schwarz criterion	5076.456	Hannan-Quinn	5067.329

CONCLUSIONS

Incomes, number of employees in the family, age, and education level are the main factors that determine the percentage of food that is thrown. Income levels, age and level of education have a positive impact on increasing the percentage of food thrown away as waste. Number of employees negatively impacts percent of food thrown as waste. The best indicator for food waste measure is Y_1: value of food waste thrown. Factor of housing or flat ownership significantly affects the value of food that is thrown away. Families who do not own houses and live in rented flats or house throw less food than those who have owned a home. An important factor that influences the value of this issue is also the type of family. A single person family throws 879 ALL per week on average, in the range of 480.5 to 1278.8 ALL. Meanwhile a family with a few members to a family with more members is accompanied with reduction of the value of food that is thrown during a week respectively: childless couples families 681.5ALL for week, couples with a child 515.8ALL for week, couple with two children 496.2ALL for week, couple with three children 568ALL for week. Increasing in member is associated with a reduction of the value of the food thrown away for a week, with 57 ALL when income and ownership of housing or flat and immigration remain unchanged. Immigration affects the reduction of the value of food thrown weekly. During a week, in the family that hasn't member in emigration, value of foods thrown is 124 ALL more than a family with member in migration, in conditions where the income, ownership of house or flat and type of family remain unchanged. The value of food thrown away is influenced by the level of the incomes. Increasing the family's average incomes with 10 thousand ALL, the average amount of food thrown away for a week is increased by 225 ALL. On average, in Albania in the urban area the value of the food thrown away is 12917932023

ALL (409309 family in urban area x52.14weeks x605,3 ALL per week) or 94998765EUR (1EUR= 135.98 ALL). The average value of food waste per year by urban families is 232 EUR or 19.4 EUR per month. The average weight of food that is thrown during a week on urban household is 1.042kg. Apartment and house ownership factors influence significantly the weight of food that is thrown. Families living in private home throw away 0.902 kg food per week, holders of apartments throw 0.86 kg per week. Households living in private rented houses 0,762 kg per week and those living in the rented apartment throw 0.686 kg food per week. Families who do not own houses and live in rented flats or home throw 60gr per week less food in quantity than those who have owned a home or apartment. Increasing in member is associated with a increasing with 63 gr. for week of the food thrown away, when income and ownership of housing or flat and immigration remain unchanged. Increasing the family's average incomes with 10 thousand ALL, the average weight of food thrown away for a week is increased by 283gr. Families living in the center throw more food in weight than those in the periphery. On average in Albania in the urban area the weight of food that is thrown is 22237709 kg or 22238 tons.(409309x52.14x1.042). The average value of 1 kg of thrown food is 4.271 EUR or 580ALL. On average 22.4 percent of the purchased food is thrown. As a result of these amounts of food waste, an additional quantity of 42252 tones CO_2 is produced. The largest contributors to food waste are easily perishable items like fresh fruit and vegetables, followed by bakery products, dairy products and eggs. The most mentioned drivers for food waste are: cooking too much due to a lack of experience, likes and dislikes of children, too large packaging, poor quality of purchased groceries. When using a shopping list, the amount of food thrown away per capita is lower. The most required prevention measures are organizational improvements like optimized planning of meals, adequate storage and reuse of leftovers.

IMPLICATIONS FOR PRACTICE

The main practical implication of the present study is that its results can be used in developing social campaigns targeted at decreasing the amount of food waste generated at the household level. The social campaign cannot aim at influencing too many factors at once. It is recommended to set a focus on the most important factors at first. Therefore, campaigns aimed at improving consumers' skills to predict and cook as much as needed, as well as their pre-shopping planning skills. A useful way to promote the pre-shopping activity of planning meals in advance would be to collaborate with the supermarkets. They could include in the supermarkets' catalogues some suggestions of meals and the recipes. The manufacturers and retailers could make available food products in smaller amounts, as many consumers end up buying too much of some products because there are no small packages of such items.

IMPLICATIONS FUTURE RESEARCH

In future studies, other theories of consumers behavior could be used, particularly theories aimed at explaining habitual behavior. Furthermore, there is a need to identify better mediators of the relationships between the factors and the food waste behavior. The results of the present study show that there might be an omitted mediator in the case of the buying of too much food and the drivers in the pre-shopping stage, since after controlling for the likelihood not to waste food, a direct effect of the independent variable on the reported food waste behavior still remained in both cases. Finally future research aimed at developing better measures for the constructs that influence the food waste, and investigating their effect on actual food waste behavior is recommended.

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