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A Cohort Analysis of Food Expenditure Away From Home in Turkey

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ABSTRACT

In this study, the expenditures of households on food away from home are examined using the Household Consumption Expenditure Survey, conducted by the Turkish Institute of Statistics from 2002 to 2018. We adopt the Dependent Double Hurdle model incorporating age, period, and cohort effects and the impact of socio-demographic variables. Analysis results reveal that the cohort and age effects on food expenditure away from home are significant in both participation and consumption. The findings suggest that the expenditures on food away from home for younger cohorts rise faster for older cohorts. The elasticity of food expenditures for cohorts and age groups is increasing from the youngest cohort and age group to the oldest cohort and the largest age group. We conclude that participation and consumption decisions are significantly affected by income and demographic characteristics in Turkey.

Türkiye'de Ev Dışı Gıda Harcamalarının Kohort Analizi

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ÖZ

Bu çalışmada Türkiye İstatistik Kurumu tarafından derlenen 2002-2018 yılı Hanehalkı Bütçe Araştırmaları Anketi verileri kullanılarak Türkiye'de hanelerin ev dışı gıda harcamaları incelenmiştir. Hanelerin ev dışı gıda harcamaları üzerinde hane özelliklerinin ve hanedeki bireylerin sosyo-demografik özelliklerinin yanında yaş, zaman ve kohort etkisi Çift Eşik modeli ile incelenmiştir. Elde edilen bulgular incelendiğinde bireylerin ev dışı gıda harcamalarının hem katılım hem de tüketim kararında kohort ve yaş etkisi önemli bulunmuştur. Bulgular, daha genç kohortlar için ev dışı gıda harcamasının daha yaşlı kohortlara göre daha hızlı arttığını göstermektedir. Kohortlar ve yaş grupları için gıda esneklikleri ise en genç kohortlardan ve en genç yaş gruplarından, en yaşlı kohortlara ve en büyük yaş gruplarına doğru artmaktadır. Sonuç olarak Türkiye'de gelir ve demografik değişkenler ev dışı gıda tüketiminde, katılım ve tüketim kararlarını etkilemektedir.

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1. Introduction

Consumer eating habits, preferences, and consumption structure have changed significantly in recent years. The changes in the expenditure on food away from home (FAFH) typically are contributed by

factors such as globalization, urbanization, higher income, a household with more than two earners, and increased participation of women in the labor force, etc. (Yen, 1993; Nayga and Capps, 1994; Bai et al., 2010). In addition, FAFH has increasingly become an integral part of dietary habits. While the food at home (FH) expenditure is decreasing, the share of FAFH expenditure is comparably increasing in Turkey and in the world at large.

The share of food expenditure at home and away from home was 31.9 percent and 5.4 percent of total expenditure in 2010. While these rates fell to 20.3% in FH expenditure, FAFH expenditure increased to 6.5% in 2018. Additionally, 80.22% of total food expenditure was allocated for spending on FH and 19.88% for spending on FAFH in 2010. These shares were 75.74% for spending at home and 24.26% for eating outside in 2018 in Turkey (TurkStat, 2018).

The theoretical base for food-away-from-home (FAFH) is constructed based on the household production theory (Becker, 1965; Lancaster, 1971). This model employs both time and expenditure as inputs. The time value plays a significant role in expenditure allocation between FH and FAFH (Lancaster, 1966, 1971; Prochaska and Schrimper, 1973; Yen, 1993; Manrique and Jensen, 1998; Mihalopoulos and Demoussis, 2001).

In previous literature, FAFH consumption decision varies according to potential variables such as age, education level, income, gender, time constraint, opportunity cost, region, urbanization, race, wealth, household type and household size (Prochaska and Schrimper, 1973; McCracken and Brandt, 1987; Yen, 1993; Byrne et al., 1996; Jensen and Yen, 1996; Nayga, 1996; Mutlu and Gracia, 2006; Jang et al. 2007; Bai et al., 2010; Tan, 2010; Liu et al., 2012; Haq et al. 2014; Liu et al., 2015; Ogundari et al. 2015; Cupak et al. 2016; Blick et al. 2018; Latimaha et al. 2018; Terin, 2019). A great deal of literature has investigated both the socio-demographic and the economic characteristics of households on FAFH consumption using different methodologies. For example, to find out the determinants of total household expenditures on FAFH; McCracken and Brandt (1987) used Tobit model, Yen (1993) preferred the Box-Cox Double Hurdle Model, Byrne et al. (1996) used a generalization of the Heien and Wessells approach among censored response models, Jensen and Yen (1996) applied IHS (inverse hyperbolic sine) double-hurdle model, etc.

Several studies used cohort analysis to investigate food consumption. Harris and Blisard (2001) examined the significance of performing a cohort analysis for food consumption. First, they found that sustainable economic growth made successive or younger cohorts better off than their predecessors. Second, various generations could have different tastes and preferences, and third, attitudes towards diet and health could vary across generations. Using cohort analysis, Mori et al. (2000) characterized Japanese food consumed-at-home into six categories. Based on the Bayesian method, some cohorts and age effects were recognized; for example, the lower demand for rice among the younger cohorts reflected the higher demand for beef among the younger cohorts in Japan compared to the older cohorts. American food and income expenditures are disintegrated into time (period), age, and cohort effects. There are substantial cohort effects for all food groups, with the exception of the groups of vegetables, sugar, and sweets. Blisard (2001), contrarily found no proof that the younger cohorts had

higher expenditures on FAFH than the older cohorts. Aristei, et al. (2005) observed period, age, and cohort effects on alcohol expenditures in Italy using the double-hurdle model. The finding indicated that older cohorts drink more alcohol than younger cohorts. Wendt and Kinsey (2007) examined the literature about the cohort and age effects on the food consumption of the households in the United States. The findings showed that the age effect was more likely than the cohort effect. Stewart and Blisard (2008), focused on the cohort effects at-home expenditures for the fresh vegetable group from the American Consumer Expenditure Survey to analyze changes in vegetable demand due to the generational effects. Zan and Fan (2010) analyzed the cohort effects of FAFH expenditures and found a cohort trend generally in FAFH consumption; thus, younger cohorts have a larger budget share and spend more for FAFH. Using the SUR regression model, Drescher and Roosen (2013) investigated a cohort analysis on FH and FAFH consumptions of German households over 25 years. Test results showed that age, period and cohort (APC) effects of FH and FAFH expenditures were significant.

However, generational effects in the life cycle approach were generally ignored and usually highlighted age effect on consumption of FAFH (Blisard, 2001; Zan and Fan, 2010). This aproach assumes that individuals in the same phase of life have similar consumption features (Ando and Modigliani, 1957; Gilly and Enis, 1982). However, individuals of different generations or in different age groups exhibit different consumption patterns depending on their social interactions and income status through specific tastes and preferences (Mori et al., 2000; Blisard, 2001; Drecher and Roosen, 2013). Finally, the cohort analysis can examine the generational and age impacts on household food expenditure outside homes because it allows for separating age, period, and cohort effects (Deaton and Paxson, 1997, Blisard, 2001). As well as examining how the consumption of food away from home changes between generations, it is important to understand whether food consumption at home has changed between generations in Turkey.

Some studies focused on the consumption of FAFH in Turkey (Uzunoz et al., 2011; Bozoglu et al., 2013; Terin, 2019). As distinct from other studies in Turkey, we investigate a cohort, age, and time decomposition of FAFH consumption employing the double hurdle model in this study. Therefore, the objective of this research is to investigate the impact of generation, age, and time on FAFH in Turkey for all households from 2002 to 2018. Subsequently, some social policy prescriptions for policymakers are proposed to identify population groups with some special needs that require support in their dietary plan and choices in Turkey. Finally, the consumption pattern would change during the pandemic period. The outcome also serves as a benchmark that aids in comparison during the global pandemic period.

2. Material and Method

2.1. Data, Cohort Definition, and Variables

The data set used in the empirical analysis was obtained from the Household Consumption Expenditure Survey conducted by the Turkish Institute of Statistics (TURKSTAT) from 2002 to 2018. The total sample contains 186,339 households.

Household Consumption Expenditure Survey (HCES) is defined by repeated cross-sectional surveys with no panel dimension. For this reason, the most general representation is to use a cohort formed by individuals born in the same time interval (usually a five-year age band) (Blisard, 2001). In this study, we decided to exclude from the sample all the households whose head was born after 1978 and before 1938 (age 36–80 in 2018 and age 20–64 in 2002). The sample size is 170487 households after excluding from these observations. The household heads in the sample are distributed to 9 five-years cohorts (with the first cohort representing all the household head born between 1978 and 1982, aged 20–24 in 2002, until the ninth cohort which contains those household heads born between 1938 and 1942, aged 76–80 in 2018). The birth years and the percentage of each cell for all cohorts, as reported in Table 1, defines the five years 'cohorts. The rate of all cohorts, with the first and last expectation, remains large enough and the survey remains stable throughout the year. The percentage of the first cohort is particularly small in the first 3 years, and also the percentage of the last cohort is particularly small in the last 3 years of the sample. In a cohort analysis, there is typically a considerable difference in the cohort sizes. The middle cohorts include the most observations. The oldest cohorts have generally the smallest cohort sizes because people pass away when they get older with the youngest cohorts also tend to be a smaller group because most of young individuals still live in their parent's household.

Household budget surveys in Turkey have been regularly conducted since 2002. The HCES contains information on the exact age of household heads whereas the age of household heads for the years 2006, 2007, 2008 and 2009 are given on an interval basis. Because to determine how FAFH expenditure have changed by generations, cohorts have been calculated as follows for years when the age of the household head is intermittent so as not to cause a loss of year. This interval basically as such; 25-29, 30-34, 35-39, 40-44, 45-49, 50-54, 55-59, 60-64 and last age 65 and older. The age interval of each cohort is the same age interval as the head of households at HCES in 2006. We calculated cohorts as follows for 2007, 2008 and 2009. First, the proportion of households in each of the nine cohorts was calculated for the age of household head and it exists exactly as provided. For example, approximately 9% of the total number of observations is in the first cohort for the years which the age of household head exists exactly. During the creation of cohort 1, 9% of household heads between the ages 25 and 29 were randomly selected from 8,640 sample from 2007. Other cohorts from 2008 and 2009 were calculated in the same way. Total number of observations for 2008, 2009 is 8,549 and 10,046, respectively.

In this study, the Consumer Price Index(CPI) (2003=100) is used to deflate all monetary variables. We deflated with CPI of the accommodation and restaurant services for FAFH and with the overall CPI of total expenditure variable.

Total expenditure and the square of total expenditure are the variables used as a proxy of income. Total consumption expenditure is used as an independent variable as an indicator of total income due to the fact that total expenditure data is not bias compared to income data (Deaton and Muellbaur, 1980). Because in this study, cohort-age-time decomposition structure is put on the equations for

verifying the presence of intergenerational and life-cycle patterns in FAFH expenditure. These independent variables which are expected to affect the FAFH expenditure are gender, marital status, education, occupation of household head, household type and household size with OECD equivalence scale. The definition of variables and descriptive statistics of variables in analyzing FAFH expenditure are indicated in the Table 2.

According to Table 2, 23.83% of households did not consume FAFH while 76.17% consumed FAFH from the data between 2002-2018 Household Budget Survey. The monthly average of FAFH expenditure is 85,506 TL for total sample and 112,531 TL for the household who consume out of home (positive sample). The size of a household may affect the decision to expenditure on FAFH because of the economies of scale in food consumption, in which smaller households can have cost advantages over larger households. Thus, larger household may prefer to eat at home instead of FAFH (e.g., McCracken and Brandt, 1987; Deaton and Paxson, 1998; Gan and Vernon, 2003). In addition, the work of family members may affect the decision to take FAFH due to family members who are included in long hour jobs or work outside. (e.g., Cage, 1989; Abdel Ghany and Sharpe, 1997; Cai, 1998).

Table 1. Five Years Cohorts and Percent/ of Households in Each Year

Birth date	2002_{Age}	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	n_{cohort}	2018_{Age}
1978-1982	20-24	1.86	2.43	3.01	4.53	7.53	7.83	6.82	7.14	7.00	12.00	12.23	12.92	13.15	13.41	14.00	14.48	14.58	8.79	36-40
1973-1977	25-29	9.53	9.71	10.28	11.11	12.98	12.73	12.25	12.22	12.11	14.45	14.38	14.67	14.23	14.06	14.41	14.05	14.70	12.62	41-45
1968-1972	30-34	14.31	13.53	14.47	13.97	14.42	13.96	15.55	14.96	14.59	14.11	13.96	15.29	15.21	13.87	14.58	14.31	13.89	14.33	46-50
1963-1967	35-39	16.71	16.88	16.45	16.06	16.09	14.65	14.54	14.62	13.78	14.59	13.80	14.15	14.15	14.31	13.99	14.13	15.18	15.07	51-55
1958-1962	40-44	15.94	15.65	15.22	15.20	14.46	14.74	14.79	14.49	15.91	13.35	13.13	11.69	12.35	12.65	11.60	12.75	12.35	13.97	56-60
1953-1957	45-49	14.25	13.71	14.11	13.88	12.57	13.91	13.10	12.38	12.85	11.31	12.06	10.99	10.71	11.53	11.54	10.86	11.22	12.45	61-65
1948-1952	50-54	12.31	12.02	12.29	11.27	9.26	9.65	10.09	10.69	10.96	8.40	8.90	8.56	8.71	9.37	9.31	8.67	8.13	10.05	66-70
1943-1947	55-59	8.21	8.68	7.68	7.30	7.02	7.69	7.82	8.50	8.14	6.94	6.27	6.06	5.72	6.10	5.83	6.23	6.05	7.17	71-75
1938-1942	60-64	6.90	7.39	6.50	6.68	5.67	4.85	5.05	5.01	4.66	4.85	5.27	5.68	5.76	4.71	4.74	4.51	3.90	5.55	76-80
Total		100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	

Table 2. Variable definition and descriptive statistics of variables

		Total Sample		Positive Sample	
Variable	**The definition of variables**	**Mean**	**S. Dev.**	**Mean**	**S. D**
FAFH	Monthly household exp. of FAFH	85.50	159.95	112.53	174.88
logFAFH	Logarithm of monthly exp. of FAFH	2.84	2.12	3.73	1.61
logrhar	Log of total expenditure of household	6.34	2.78	6.37	2.72
logharsq	Logarithm of total expenditure square	47.94	41.06	48.06	39.89
Gender	1, if household head is male, 0 otherwise	0.88	0.32	0.90	0.29
Hsize	Household size equalized with OECD scale	2.25	0.80	2.26	0.752
educ1	1 if household head is without any education, 0 otherwise	0.02	0.14	0.13	0.11
educ2	1 if household head is primary school graduates, 0 otherwise	0.14	0.35	0.12	0.33
educ3	1 if household head is secondary school graduates, 0otherwise	0.05	0.22	0.06	0.24
educ4	1 if household head is university graduates, 0 otherwise	0.18	0.38	0.19	0.39
occupation	1, if household head has a wage or salary, 0 otherwise	0.26	0.43	0.29	0.45
marital	1 if household head is married, 0 otherwise	0.87	0.33	0.89	0.312
Htype	1 if household type is nuclear, 0 otherwise	0.44	0.49	0.48	0.49
cohort1	1 if household head is born between 1978-1982, 0 otherwise	0.08	0.27	0.09	0.29
cohort2	1 if household head is born between 1973-1977, 0 otherwise	0.12	0.32	0.13	0.33
cohort3	1 if household head is born between 1968-1972, 0 otherwise	0.136	0.34	0.14	0.35
cohort4	1 if household head is born between 1963-1967, 0 otherwise	0.143	0.35	0.15	0.35
cohort5	1 if household head is born between 1958-1962, 0 otherwise	0.132	0.33	0.13	0.34
cohort6	1 if household head is born between 1953-1957, 0 otherwise	0.118	0.32	0.11	0.32
cohort7	1 if household head is born between 1948-1952, 0 otherwise	0.096	0.29	0.09	0.28
cohort8	1 if household head is born between 1943-1947, 0 otherwise	0.069	0.25	0.06	0.23
cohort9	1 if household head is born between 1938-1942, 0 otherwise	0.104	0.30	0.07	0.26
age1	1 if household head is between 20-24 years old, 0 otherwise	0.004	0.06	0.003	0.05
age2	1 if household head is between 25-29 years old, 0 otherwise	0.040	0.19	0.04	0.19
age3	1 if household head is between 30-34 years old, 0 otherwise	0.092	0.28	0.09	0.29
age4	1 if household head is between 35-39 years old, 0 otherwise	0.139	0.34	0.14	0.35
age5	1 if household head is between 40-44 years old, 0 otherwise	0.144	0.35	0.15	0.36
age6	1 if household head is between 45-49 years old, 0 otherwise	0.136	0.34	0.14	0.35
age7	1 if household head is between 50-54 years old, 0 otherwise	0.126	0.33	0.12	0.33
age8	1 if household head is between 55-59 years old, 0 otherwise	0.100	0.30	0.010	0.29
age9	1 if household head is between 60-64 years old, 0 otherwise	0.082	0.27	0.076	0.26
age10	1 if household head is older than <=65, 0 otherwise	0.138	0.34	0.11	0.31
year1	Normalized dummy variable 1 if year is 2002, zero otherwise	0.054	0.22	0.05	0.22

year2	Normalized dummy variable 1 if year is 2003, zero otherwise	0.147	0.35	0.13	0.33
year3	Normalized dummy variable 1 if year is 2004, zero otherwise	0.049	0.21	0.045	0.20
year4	Normalized dummy variable 1 if year is 2005, zero otherwise	0.049	0.21	0.048	0.21
year5	Normalized dummy variable 1 if year is 2006, zero otherwise	0.049	0.21	0.048	0.21
year6	Normalized dummy variable 1 if year is 2007, zero otherwise	0.049	0.21	0.046	0.20
year7	Normalized dummy variable 1 if year is 2008, zero otherwise	0.049	0.21	0.050	0.21
year8	Normalized dummy variable 1 if year is 2009, zero otherwise	0.049	0.21	0.058	0.23
year9	Normalized dummy variable 1 if year is 2010, zero otherwise	0.057	0.23	0.060	0.23
year10	Normalized dummy variable 1 if year is 2011, zero otherwise	0.057	0.23	0.056	0.23
year11	Normalized dummy variable 1 if year is 2012, zero otherwise	0.053	0.22	0.055	0.22
year12	Normalized dummy variable 1 if year is 2013, zero otherwise	0.052	0.22	0.056	0.23
year13	Normalized dummy variable 1 if year is 2014, zero otherwise	0.052	0.22	0.055	0.22
year14	Normalized dummy variable 1 if year is 2015, zero otherwise	0.051	0.22	0.126	0.33
year15	Normalized dummy variable 1 if year is 2016, zero otherwise	0.059	0.23	0.045	0.20
year16	Normalized dummy variable 1 if year is 2017, zero otherwise	0.059	0.23	0.048	0.21
year17	Normalized dummy variable 1 if year is 2018, zero otherwise	0.056	0.23	0.048	0.21
Sample size		170487		129864	

2.2. Model Specification and Method

The application of a repeated cross-sectional analysis prevents any panel effects, which are undesirable effects when participants adjust their attitudes or behavior structures since they are partaking in a longitudinal survey. Alternatively, none of the households are analyzed more than once in any occasion, but different samples of individuals from cohorts are observed at different times (Blisard, 2001; Glenn, 2005; Steward and Blisard, 2008). The APC model or cohort analysis decomposes the data into the age (A), period (P) and cohort (C) effects (Blisard, 2001).

In repeated cross-sectional research, the modeling of age, period and cohort effects are complicated by the linear dependence of these three variables (period =age+cohort) under analysis. These dependencies mean that the same data creation process can be modeled correctly with a combination of several different ages, periods, and cohort effects. Cohort analysis obtain a special feature to consider in order to acquire consistent analysis (Glenn, 2005). Age, Period and Cohort variables describe themselves linearly. All three effects are the linear function of the other two effects. In other words: “the year in which every household is observed, equals the age of the household, a, plus the year of birth, b"(Aristei, et al., 2005, p. 13). While there is no consensus on the best solution in the

literature, various approaches to resolving the defining issue have been proposed (Zan and Fan, 2010). Deaton and Paxson (1994) propose two restrictions on the effects of time. The first restriction denotes time effects are orthogonal to a linear time trend, and the second restriction states the sum of the year effects is zero. According to Deaton and Paxson (1994) put forward that there is a zero-time effect in the long-run. This restriction allows short-run time effects such as business cycles to be considered (Blisard, 2001; Lührmann, 2010). In this paper we use the linear APC decomposition used. For example, A, P and C are dummy variables representing age, year and cohort. The age indicates life-cycle changes according to the age effects. Again, the cohort effects are linked with generational effects, whiles the year effects cause some changes temporarily in the household's consumption (Deaton, 1997). According to Deaton (1985, 1997), the APC variables is constructed utilizing the mean values of the variables in each cohort. Finally, Aristei et al. (2008) and Stewart and Blisard (2008) is followed and the basic APC model for determining the generation effects of FAFH expenditure which is made is given follows:

$$Y_i = \alpha_0 + \sum_{k=1}^{9} \delta_{ik} C_k + \sum_{p=1}^{10} \gamma_{ip} A_p + \sum_{m=3}^{17} \eta_{im} Y_m \qquad \text{(Eq.1)}$$

Where y_i represents FAFH expenditure of household, $C_{k,}$ A_p and Y_m show Cohort, Age and Y year dummies, δ, γ and η are parameters, respectively.

Figure 1 present cohorts, age and year decomposition of real FAFH in Turkey, respectively.

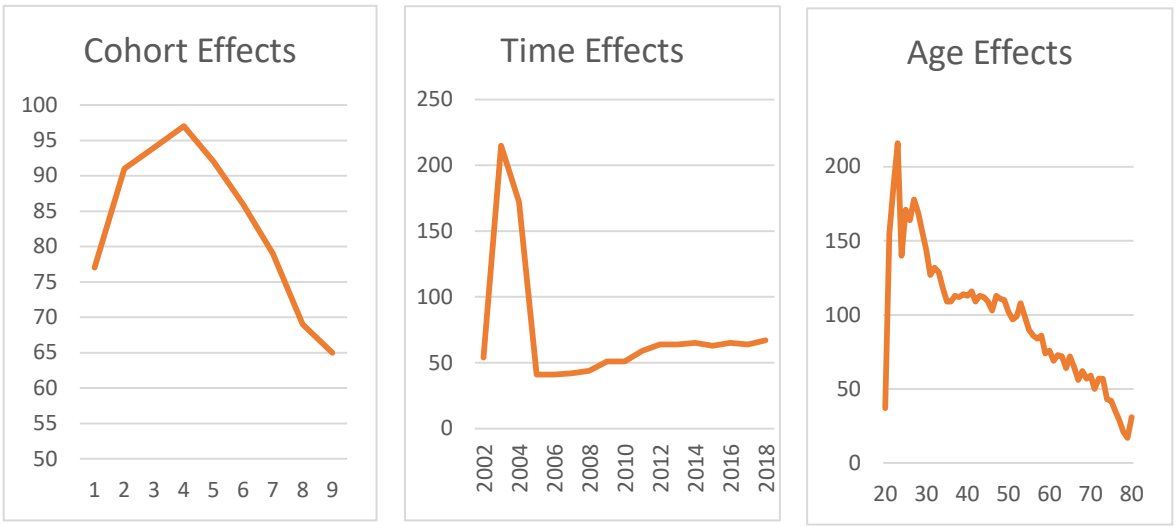

Figure 1. Real monthly food away from home expenditure decomposed by cohort, age and period

There is an increases in food expenditure away from home for the oldest versus youngest cohort. At the examination of the age effect, it was observed that FAFH expenditures were highest in the youngest age group, but there were significant decreases in FAFH spending among the older age

groups, with the lowest FAFH expenditure in the 29-34 age group and households in the 76-80 age group.

Time effects in the figure show a sharp increase in FAFH spending in 2003, while there has been a monotonous increase in FAFH spending since 2010. Within the framework of the European Union harmonization studies and in order to form the basis for the harmonized consumer price index, which will be implemented as of 2003, the sample size of the "Household Budget Survey" was expanded only for 2003 and 25 920 households were surveyed. Since 2004, the annual sample size of the studies has been reduced again and the annual survey system has been continued. Therefore, it can be said that the reason for the significant increase in FAFH in 2003 was due to the sample size of data (TURKSTAT, 2004).

The dependent variables in this study include a large number of zero values because many households do not consume FAFH. Therefore, different censored dependent variable models (such as, Double Hurdle and Infrequency of Purchase) is used. Dependent Double hurdle model is found to best fit the data for FAFH according to the Vuong test (Vuong test=3.23; z_t=1.96; reject H_0 in favour of DDH)

The LR test is also implemented to verify whether or not cohort and age have separate or joint effects on FAFH expenditures. The tests confirm that the FAFH consumption change according to cohort and age (Table 3).

In this study, dependent double hurdle model is adopted by the cohort for analyzing the expenditure on FAFH which is based on a two-stage decision. The first stage is a participation equation as the first hurdle equation and the second equation is a consumption equation as the second hurdle equation, as follows (Yen and Su, 1995; Yen and Huang, 1996; Yen and Jones, 1997; Aristei, et al., 2008).

$$y_i = \begin{cases} y_2^* & if\ y_1^* > 0\ and\ y_2^* > 0 \\ 0 & otherwise \end{cases} \quad \text{(Eq.2)}$$

Participation equation:

$$y_1^* = z_i\alpha + u_1 \quad \text{(Eq.3)}$$

Consumption equation:

$$y_2^* = x_i\beta + u_2 \quad \text{(Eq.4)}$$

$$y_i = \begin{cases} y_2^* & if\ y_1^* > 0\ and\ y_2^* > 0 \\ 0 & otherwise \end{cases} \quad \text{(Eq.5)}$$

A positive expenditure of FAFH (y_i=y_2^*) is observed only if the household is a potential consumer ($y_1^* > 0$) and actually spends FAFH ($y_2^* > 0$). Zero values are the results of either participation or

consumption decisions and potential consumer may have zero expenditure on FAFH (Aristei et al., 2008). The matrices z and x include the explanatory variables of first and second equations, respectively. In addition, we assume u_1 and u_2 in equations are distributed as bivariate normal distribution and ρ is the correlation coefficient.

$$(u_1, u_2) \sim BVN(0, \Sigma), \qquad \Sigma = \begin{bmatrix} 1 & \sigma\rho \\ \sigma\rho & \sigma^2 \end{bmatrix} \tag{Eq.6}$$

The likelihood function for dependent Double Hurdle model can be written as:

$$L = \prod_{y_i=0} \left[1 - \theta(z_i\alpha, \frac{x_i\beta}{\sigma}, \rho)\right] \prod_{y_i>0} \left[z_i\alpha + \frac{p}{\sigma} \frac{(y_i - x_i\beta)}{\sqrt{1-\rho^2}}\right] \frac{1}{\sigma} \emptyset \left[\left[\frac{(y_i - x_i\beta)}{\sigma}\right]\right] \tag{Eq.7}$$

where p denotes probability, $\emptyset$ (.) and θ (.) are the univariate standard normal probability density function and cumulative density function, respectively (Yen, 1993).
Incorporate heteroscedasticity into the double hurdle model, the standard deviation can be specified as (Godfrey, 1978).

$$\sigma_i = \exp(w_i \gamma) \tag{Eq.8}$$

To understand the impact of the explanatory variables on the dependent variable, it needs analyzing their marginal effects. The marginal effects are not presented due to space limitations, the equations of the marginal effect which were used in this study took from Yen and Su, 1995, Mutlu and Garcia, 2006.

3. Empirical Results

The results obtained after the estimation of the dependent Double-Hurdle model are given in the Table 4. The heteroscedasticity parameters of the continuous variables are statistically significant, implying the presence of heteroscedasticity of the error terms.

Table 4. Estimation of dependent double hurdle model and marginal effects

Variable	Participation		Expenditure		Prob of consumption		Conditional level of cons.	
	Coef.	Z test	Coef.	Z test	Coef.	Z test	Coef.	Z test
logrhar	0.33	46.09*	0.75	76.08*	0.726	79.57*	0.964	87.85*
loghrsq	-0.02	-39.28*	-0.03	-65.07*	-0.035	-67.01*	-0.047	-73.87*
gender	0.34	21.54*	0.30	15.10*	0.283	22.26*	0.496	26.31*
marital	-0.13	-8.26*	-0.25	-13.29*	-0.038	-8.70*	-0.242	-13.08*
educ2	-0.18	-15.07*	-0.19	-11.63*	-0.051	-15.27*	-0.183	-11.29*
educ3	0.10	4.81*	0.04	1.97*	0.026	4.56*	-0.045	-2.13*
educ4	0.07	6.98*	0.06	5.76*	0.018	6.63*	0.059	5.55*
occup1	0.44	44.30*	0.52	45.86*	0.183	0.75	0.054	9.68*
hsize	-0.002	-0.56	0.05	9.66*	0.203	2.06*	0.143	16.22*
htype	0.20	26.18*	0.15	16.74*	0.123	5.01*	0.502	6.63*
cohort1	0.06	0.98	0.70	8.39*	0.615	6.03*	0.688	8.36*
cohort2	0.02	0.27	0.52	7.00*	0.417	4.63*	0.510	6.99*
cohort3	-0.06	-1.22	0.36	5.63*	0.207	2.62*	0.363	5.67*
cohort4	-0.10	-2.21*	0.20	3.60*	0.140	2.59*	0.203	3.66*
cohort5	-0.10	-2.61*	0.06	1.31	-0.068	-1.77*	-0.013	-2.38*
cohort6	-0.08	-2.70*	-0.01	-0.37	-0.109	-2.29*	-0.011	-3.91*
cohort7	-0.04	-1.61	-0.02	-0.70	-0.062	-1.57	-0.020	-0.97
cohort8	-0.03	-1.29	-0.01	-0.66	-0.043	-1.40	-0.016	-1.22
age1	0.18	1.99*	-0.72	-6.27*	0.337	2.41*	-0.713	-6.33*
age2	0.15	2.25*	-0.58	-6.81*	0.268	2.13*	-0.582	-6.87*
age3	0.26	4.37*	-0.42	-5.68*	0.019	4.27*	-0.429	-5.81*
age4	0.34	6.63*	-0.30	-4.54*	0.178	6.55*	-0.306	-4.73*
age5	0.40	9.02*	-0.11	-1.93	0.395	8.99*	-0.122	-2.18*
age6	0.43	11.38*	0.10	2.13*	0.489	11.42*	0.086	2.92*
age7	0.40	13.04*	0.20	5.22*	0.435	13.15*	0.190	4.88*
age8	0.33	13.42*	0.23	7.32*	0.471	13.56*	0.219	6.99*
age9	0.20	10.61*	0.14	5.63*	0.346	10.72*	0.133	5.37*
year3	-0.04	-2.33*	0.15	16.74*	-0.356	-13.67*	-0.396	-18.74*
year4	0.16	9.16*	1.43	27.15*	-0.963	-35.44*	-1.491	-69.54*
year5	0.10	5.56*	-1.53	-66.54*	-0.356	-13.67*	-1.510	-66.94*
year6	0.04	2.17*	-1.49	-63.38*	-0.963	-35.44*	-1.468	-63.62*
year7	0.21	10.99*	-1.58	-68.45*	-0.958	-33.01*	-1.559	-69.21*
year8	0.20	11.02*	-1.34	-60.41*	-0.785	-28.44*	-1.319	-61.08*
year9	0.25	13.82*	-1.28	-58.24*	-0.683	-24.81*	-1.267	-59.08*
year10	0.27	12.49*	-1.23	-47.21*	-0.626	-19.19*	-1.221	-47.86*
year11	0.45	19.77*	-1.05	-37.56*	-0.267	-7.72*	-1.045	-38.57*
year12	0.38	15.83*	-1.25	-43.44*	-0.504	-13.98*	-1.237	-44.23*
year13	0.36	14.36*	-1.23	-41.07*	-0.521	-13.95*	-1.220	-41.75*
year14	0.45	17.36*	-0.98	-29.47*	-0.217	-5.45*	-0.977	-30.19*
year15	1.33	43.09*	0.91	22.60*	0.227	48.73*	0.852	22.57*
year16	1.39	43.60*	0.90	21.47*	0.232	48.41*	0.834	21.38*
year17	1.40	43.56*	0.94	22.23*	0.237	48.91*	0.872	22.19*
Cons	-1.54	-48.95*	1.43	27.15*				
Sigma	1.34	(s.d=0.002*)						
ρ			0.59	2.63				
-LogL	-304423.48							
Heteroscedasticity Equation								
Loghar	1.53	25.79*						
Logharsqr	-0.11	-19.30*						
Hsize	0.17	13.98						

Notes: Asterisks indicate levels of significance; *: 0.05

Firstly, specification and evaluation is performed on the heteroscedasticity equation. Household size, log of household expenditure and square of logarithmic household expenditure that are considered to cause heteroscedasticity problem are found statistically significant. Therefore, heteroscedasticity consistent standard errors are calculated for dependent double hurdle models of FAFH in this study (White, 1980). While the interpretation is focused on cohort, age, period effects on FAFH, the demographic variable coefficients for each model have a statistically significant effect on FAFH (Table 5).

Total household expenditure has a positive effect on both equations of dependent double hurdle models. Square of total household expenditure has a negative effect on both market participation and consumption equations of dependent double hurdle models for FAFH.

The male headed household has a statistically significant and a positive effect on the probability decision of FAFH, while married household has a negative effect on the participation and the consumption decisions of FAFH. Urban households with a married head are 4.14% less likely to spend on FAFH than their unmarried peers.

It is worth noticing that the household size which is equivalent with OECD scale has a significantly positive effect on the expenditure decision of FAFH, but has no statistically significant effect on the FAFH participation decisions.

Household heads who earn a wage or salary has a positive effect on the probability and the consumption level of FAFH whereas influencing negatively the expenditure share of food. The nuclear type of household also has a positive and statistically significant effects on the decision on FAFH.

Generally, the estimated parameters with respect to the education levels of the household head are statistically significant. Household with higher education levels tend to have both a higher probability of FAFH participation and a higher FAFH consumption.

As compared to the base category which is the oldest age group (household head is equal or over 65 years old- in the base category), we discover that the likelihood of household FAFH market participation increases as the age of household head increases whereas the expenditure level of FAFH decreases for household head aged 44. After 44 years old, household head FAFH expenditure increases with respect to the base category.

In an attempt to assess the generational effects on FAFH market participation and consumption decisions, the cohorts between cohort 4 and cohort 6 generation tend to participate less than the oldest cohort, the other cohort groups are not statistically significant whereas the younger cohort (between cohort 1 and cohort 4) decide to spend more in the FAFH market than the oldest generation. The older generational effects (between cohort 5 and cohort 8) are not difference from zero for the expenditure level of FAFH.

The coefficient of all year variables has significant and positive effect on the market participation for FAFH expenditure whereas these effects are statistically significant with a negative sign in the expenditure equation of both FAFH.

The marginal effects on probability of market participation and conditional level of consumption with respect to explanatory variables and cohort, age for dependent double hurdle models of FAFH are given in Table 4. The obtained signs are consistent with theoretical expectations.

Regarding to total household expenditure, the probability of consumption and the conditional level of consumption for FAFH are positive and statistically significant, while total household expenditure squared is negative and significant. This implies that as total household expenditure increases, the potential consumer of FAFH leads to a higher propensity to eat food away from home, but at a decreasing rate. Hence a one percent increase in total expenditure increases the probability of purchasing food away from home of potential FAFH consumers by 0.726%.

A one percent increase in total expenditure increases the expenditure of FAFH by 0.964% for the already existing consumers participating in the FAFH market increase. But these two effects first increase, then decrease after a certain point. It means that an increase in total expenditure induce higher expenditures on FAFH.

Married household heads are less likely to participate in the purchase and spend food away from home as compared to unmarried headed household.

Household size adjusted by equivalence scale has no effects on the probabilities of participation for FAFH, while having a positive effect on the conditional consumption level of FAFH. But the conditional level of FAFH is rather high. It means that an increase in household size is likely to induce higher expenditures on food outside for existing FAFH consumers as expected.

The male headed household are 34% more likely to participate in consumption on FAFH and 49.6% more likely to consume FAFH than the base category (the female headed households).

Analyzing the effect of household heads with respect to education, it can be pointed out that the higher educated the household head, the more likely he is to purchase and tend to consume more FAFH than the base category. These positive effects of education are in agreement with the previous study (Bozoğlu et al. 2013).

Nuclear households are approximately 20% more likely to participate in the purchase of FAFH and 50.2% more likely to consume food away from home with respect to other household type.

With regard to cohort effects in FAFH, the first four cohorts, which were born 1978-1982 and 1973-1977, 1972-1976, 1967-1971 are more likely to purchase FAFH in the market and consume FAFH according to the oldest cohort. The youngest cohort is approximately 61.5% more likely to participate in the consumption of food away from home and 68.84% are more likely to consume FAFH than the oldest cohort which was born 1938-1942. For the cohort 5 (household head was born between 1958-1962) and the cohort 6 (household head was born between 1953 and 1957) both probability of FAFH and the conditional level of FAFH is negatively marked and statistically different from zero as a compared with the oldest cohort. This implies that as household with household headed was born 1958-1962 and 1953-1957, the potential consumer of FAFH will lead to less propensity to eat away from home and cause less expenditures on FAFH for existing consumers of FAFH than the oldest

cohort. This is mainly due to a decrease in potential consumers of FAFH expenditure by 6.8% for cohort 5 and 10.9 for cohort 6. Also the conditional level of FAFH consumption for these middle-age generations is particularly small. This result is unsurprising given the abundance of public health information on eating out at home.

However, the seventh and eighth cohorts have a negative effect but has no statistically significant effect on the probability of participation in the FAFH market and the conditional level of FAFH.

With regard to the age effects, all age groups tend to participate positively in FAFH market compared to the oldest age group, but the likelihood of market participation of older age group is higher than the younger age group for FAFH. Getting older age will lead to higher propensity to eat out of home. However, the conditional level of FAFH expenditure for age groups indicate that the first 5 age group (household head aged 20-24 and aged 40-44) intend to reduce their expenditure of food away from home compared to the reference age group 10 (household head aged over 64 years old) whereas the last 5 age groups (household aged 45 and 64) increase their food away expenditure. On the other hand, the young and middle age groups will lead to lower rate of expenditure on FAFH, while getting older leads to a higher rate of consumption.

4. Conclusion

The objectives of this paper were to determine the generational effects on food away from home consumption. The data used is decomposed into cohort, age and period effects using the dependent Double Hurdle models. The findings suggest that the expenditure of food away from home for younger cohorts rises faster for older cohorts. There is the presence of intergenerational differences.

Regarding age effects, all age groups tend to participate positively in the FAFH market compared to the oldest age group, but the older age group is more likely to participate in the market than the younger age group for FAFH. However, while the young and middle age groups will lead to a decrease in the rate of expenditure on FAFH in Turkey, the consumption rate will be higher as they get older.

The results also show that the total expenditure and the socio-demographic characterization are relevant on the expenditure of FAFH. As total household expenditure increases, the potential consumer of FAFH leads to a higher propensity to eat food away from home, but at a declining rate.

Furthermore, an increase in total household expenditure is more likely to cause higher expenditures of FAFH for existing consumers than potential FAFH consumers who buy food away from home.

The elasticity of food expenditures for cohorts and age groups is increasing from the youngest cohort and from the youngest age group to the oldest cohort which is the largest age group. Households should learn to buy healthy food items when eating away from home. The household should also have enough information that will guide them in the purchase of healthy food away from home. In order to consume healthy FAFH, the household must receive nutritional training.

When households are properly informed about identifying adequately these healthy food options coupled with in nutritional training programs, this household consciously would then prefer to buy less FAFH items.

An increase in the availability of varieties of healthy meals at restaurants is not alone a sufficient factor to improve the dietary quality of households purchases of FAFH. In addition to all these, the results suggest that tastes, preferences and habits continue to be one of the drives for the purchase of FAFH.

Many food-away-from-home facilities are temporarily closed during the COVID-19 pandemic. The FAFH is recognized as an important contributor to nutritional dietary habits of individuals and as such should be considered in a public health perspective. Its negative impacts on health calls for the attention of a public health issue that nutrition science will experience due to coronavirus pandemic), beyond the nutritional quality of foods produced outside the home. Therefore, the exposure to foods prepared away from home, especially those delivered to various places like offices and homes, can bring us many challenges that require intense solution for coping with the problems related to FAFH.

Statement of Conflict of Interest

Authors have declared no conflict of interest.

Author's Contributions

The contribution of the authors is equal.

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