

Expenditure Elasticities for Major Food Groups in Yemen Pre and Post War

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Abstract: *The purpose of this paper is to highlight changes in household income and estimate the elasticities of expenditure on food groups in Yemen pre and post war through a personal interview by a questionnaire form for a random sample consisting of 200 households in four Yemeni governorates, namely Sana'a, Ibb, Hadhramaut, and Aden, where then estimated expenditure elasticity for the 12 most important food groups And one non-food group is (group of cigarettes, tobacco, and qat), as it represents an important percentage of a household's daily expenditures. The expenditure elasticities estimates in post-war recorded a decrease for all food groups compared to the pre-war period, except for the expenditure elasticity of fish, which increased from -0.3 as an inferior good in pre-war to 0.5 as a necessary good after the war. And the income elasticity of cereals recorded decrease from 0.96 to 0.3. Finally, the expenditure elasticity on (group of cigarettes, tobacco, and qat), as a non-food group achieved a decrease from 1.5 as a luxury good before war to 0.9 as almost a normal good post the war period.*

Keywords: Food Consumption, Expenditure, Elasticity, Yemen

1. Introduction

Yemen is located between Oman and Saudi Arabia in southwest Asia. It overlooks the Bab al-Mandab Strait, which connects the Red Sea to the Indian Ocean through the Gulf of Aden. It is bordered to the north by the Kingdom of Saudi Arabia and the Sultanate of Oman to the east. To the south is the Arabian Sea and to the west is the Red Sea.¹ The Population of Yemen was about 29, 665.38 million,² and Yemen's economy is largely based on agriculture. It is one of the main domestic sectors that contributes to Yemen's GDP.³

Yemen is a low-income country with a GNI amounts to USD 19.4 billion and per capita GNI averages USD 870 in nominal tern contrast to its neighboring countries, and the Yemen's economy is mainly dependent on agriculture.⁴

The report of the Food and Agriculture Organization of the United Nations in the report on the state of food security and nutrition in the world in 2018 indicates that Yemen ranked first in terms of the highest prevalence of undernourishment in the total population at 34.4 percent at the level of all Arab countries.⁵ The FAO report indicated that the conflict in Yemen led to the deterioration of the food security and nutrition situation, leaving about 60 percent of the population in a state of emergency and severe food crisis, as one out of every three households suffers from poor food consumption, which reflects the extremely negative diet of In terms of quality and quantity, which consists mainly of bread, sugar, and oil.⁶

The total annual expenditure on food goods amounted to 4290.6 million dollars in 2005, and its value increased to 14042.7 million dollars in the 2014 year, where represents a large percentage of the total annual spending on all goods and services, as well as the relative importance of annual

expenditure on food has increased from 44.8 percent in 2005 to 48.6 percent in 2014 year according to the latest household budget survey before the war.⁷ Since the studies related to estimating the elasticities of expenditure on food in Yemen are almost non-existent, as well as the lack of recent data due to the war in Yemen for more than seven years ago, the study was conducted on 200 household included four governorates through a questionnaire prepared to obtain the data Required to estimate expenditure elasticity and expenditure preferences for the major food groups in Yemen, where included 12 food groups and one non-food group (group of cigarettes, tobacco, and qat), but it constitutes an important part of the daily expenditure of most heads of households in Yemen. Therefore, assessing the elasticity of expenditure on food is very important, especially in light of the current conditions in Yemen and what Yemen is going through in light of the ongoing war. Perhaps this will be among the keys to the upcoming solutions when formulating and preparing policies related to food in Yemen after the war has stopped.

Food diversity and the degree of preference for one food group over another varies between countries according to the economic case and the level of per capita income, so, thus the income elasticity of the food commodities varies between countries, where numerous studies have indicated that as ulubasoglu M., et al., (2016) note that the elasticity for milk, bread, fresh fruits and fresh vegetables, which ranged from 0.37 to 0.94, which is less elastic than all types of meat, rice, sugar, jam, preserved fruits and vegetables, which achieved a elasticity income in expenditure ranging between 1.19 and 1.64.⁸ Muhammad et al., (2011) mentioned there is a greater response to changes in income and food prices in low-income countries comparing the rich countries.⁹ Chen et al., (2015) found that income elasticities of demand for many food products decline as per capita income increases.¹⁰

The food price elasticities different across city sizes which the household resides and has significant effect on consumption patterns as mentioned Navamuel et al., (2014).¹¹ Study of sengul, H., & Sengul, S. (2006) to explore similarities in dietary structure between Turkey and European Union countries; the empirical results showed that per capita food consumption is becoming less responsive to changes in income and appears to be reaching a ceiling in the majority of EU countries and Turkey.¹²

2.Data And Methods

The main aim of this paper is to estimate changes in household income the elasticities of expenditure on major food groups in Yemen pre and post war. The study was conducted on 200 Yemeni household during the month of October 2021 year by the personal interview of the heads of households through a questionnaire form that was randomly distributed in four main governorates out of 21 governorates at the level of the Republic of Yemen. The list of the major food groups in Yemen was adopted according to the published reports on household budget surveys issued by the Ministry of Planning, except for the rice crop that was added because it was not on the list since Yemen does not produce rice crop, and all rice consumed is imported. The group of (group of cigarettes, tobacco, and qat) is considered a non-food group, but it was studied because it constitutes an important part of the daily expenditure of most heads of households in Yemen. Data collected from heads of households about the monthly income pre and post the war and the amount of household expenditure on the major food groups monthly. And after obtaining the data, the monthly income for the post-war period was calculated based on fixed prices as a result of the change in the exchange rate and the deterioration of the value of the national currency significantly during the war. It is known that the elasticity of expenditure on food commodities decreases with the increase in per capita income, and this is consistent with most studies in this field, but some food commodities may become negative as per capita income increases or vice versa.

The log-log model was used to estimate the expenditure elasticity of the major food groups in Yemen pre and post war because, by using the logarithm of one or more variables, a nonlinear relationship can be effectively forged while maintaining its linearity. Thus, it is interpreted as the expected percentage change in the value of Y when the value of X increases by a percentage. Consequently, both Y and X are converted logarithmic to econometric elasticity, and the logarithmic modulus of X is referred to as elasticity. The logarithmic model was used to calculate elasticity as follows:

$$\log Y_i = \beta_0 + \beta \log x_i + \epsilon_i$$

The linear logarithmic analysis aims to determine which components of the model are necessary to include to better calculate the data, It was used here to calculate the expenditure elasticity on food. In a log-log regression model, elasticity is expressed by β_1 .¹³ Since the dependent variable here is expenditure on food, the independent variable is income, so the calculation and interpret of the

results of elasticity the in a log-log regression model are as follows:

$$\left(\frac{\partial}{\partial \text{income}}\right) \log(\text{expenditure}) = \beta_0 + \beta \log(\text{income})$$

$$\Rightarrow \left(\frac{d \text{income}}{\text{income}}\right) = \left(\frac{d \text{expenditure}}{\text{expenditure}}\right) \cdot \beta_1$$

$$\Rightarrow 100 \cdot \frac{d \text{income}}{\text{income}} = 100 \cdot \frac{d \text{expenditure}}{\text{expenditure}} \cdot \beta_1$$

$$\Rightarrow \% \Delta \text{income} = \% \Delta \text{expenditure} \cdot \beta_1$$

then therefore we can interpretation of Beta in log-regression as: if income is increased by one percent, we expect expenditure to increase by β_1 percent.

3.Results and Discussion

3.1. The socio-demographic profile of the respondent households

The data of the social characteristics of the heads of households in (Table No. 1) showed that the majority of families are headed by males, at a rate of 85.5 percent that means that the role of women is still weak in Yemen, and this is consistent with the results “Global Gender Gap Report” where Yemen is ranked 130th out of 130 countries In terms of gender disparity.¹⁴

Table 1: Households respondents' socio-demographic characteristics

The socio-demographic characteristics	Total (N)	percentage
Gender of the household head		
Male	171	85.5
Female	29	14.5
Age of the household head		
20-30 year	73	36.5
31-40 year	80	40.0
41-50 year	30	15.0
51 above year	17	8.5
Marital status		
Single	54	27
Married	142	71
Divorced	3	1.5
Widowed	1	0.5
Education of the household head		
Elementary	3	1.5
High school	34	17
Diploma	21	10.5
Bachelor degree	97	48.5
Master degree	33	16.5
Doctorate degree	12	6
Number of household members		
1 - 3 members	57	28.5
3 - 5 members	58	29
5 - 7 members	47	23.5
7 - 10 members	30	15
More than 10 members	8	4
Occupation of the household head		
Government job	63	31.5
Self-employed	111	55.5
Trader	13	6.5
cultivator	9	4.5
Others	4	2

Source: Data gathered through Primary Investigation, 2021

The most of the respondents' heads of households are between the ages of 31-40 years, and they are within the young category where abdu et al., 2020 study which indicates that a large proportion of Yemen's population is young, and more than 40% of the population under the age of 14 year.¹⁵ It was found that 48.5 percent of the heads of households have completed education and obtained a bachelor's degree, followed by 17 percent of those who obtained a high school diploma.

The average of household members in the study community is 4 persons, and self-employment is considered the occupation for most of the respondents' heads of households, at 55.5 percent, followed by a government job by 31.5 percent, where the majority of individuals prefer

self-employment for various reasons, including earning money, independence and wealth creation, which motivates many to pursue self-employment, including graduates of Yemeni universities.¹

3.2. The monthly expenditure for the major food groups in Yemen pre and post war

Table No. 5.8 shows household income and expenditure on the major food groups in Yemen pre-war period, where the average total monthly income of household amounted to 129, 220 Y.R, while the average total monthly expenditure of household was 107, 449 Y.R, which is 83.2 percent of the total monthly income.

Table 2: Monthly expenditure (in Y.R) for major food groups in Yemen pre-war

No	Expenditure	Minimum	Maximum	Mean	Std. Deviation	%
1	Grains and derivatives	0	50000	14273	8673	13.3
2	Rice	0	50000	12788	8644	11.9
3	Dried & preserved legumes	0	30000	6418	4555	6.0
4	Fresh and o vegetables	1000	30000	9227	6975	8.6
5	Fresh and preserved fruits	1000	40000	9020	6550	8.4
6	Meat	0	50000	12575	10009	11.7
7	Fish	0	50000	6910	7402	6.4
8	Dairy products	0	30000	6369	5017	5.9
9	Food oil	1000	20000	5593	3400	5.2
10	Sugar and sugar products	0	24000	5508	3601	5.1
11	Tea, coffee and coca	0	100000	4185	7391	3.9
12	Cigarettes, tobacco and qat	0	200000	14583	22260	13.6
	Total	-	-	107449	-	100
	Monthly Income	10000	600000	129220	80292	-

Source: Data gathered through Primary Investigation

Despite the highest percent of expenditure going to (group of cigarettes, tobacco, and qat) which are a non-food group, they constitute a large percentage of monthly household expenditure where ranked first with of 13.6 percent. As for expenditure on other food groups, grains, rice, meat, vegetables, and fruits, accounted for the highest expenditure percentage with 13.3, 11.9, 11.7, 8.6, and 8.6 percent respectively.

But regarding the war period, there were many economic imbalances, most notably the rise in the general level of prices and the devaluation of the national currency very significantly. So, in order to avoid double-counting, the fixed prices were adopted, as the primary data for income obtained from household head respondents for the post-war period was greater compared to the pre-war period. However, its purchasing power decreased significantly post war, and therefore, household heads respondents income were calculated according to the prices of pre-war period.

Table 3: Monthly expenditure (in Y.R) for major food groups in Yemen post-war

No	Expenditure	Minimum	Maximum	Mean	Std. Deviation	%
1	Grains and derivatives	0	50000	11471	8222	13.2
2	Rice	0	100000	12432	14735	14.3
3	Dried & preserved legumes	0	50000	5991	6736	6.9
4	Fresh and o vegetables	430	50000	7507	7444	8.7
5	Fresh and preserved fruits	0	50000	6070	6409	7.0
6	Meat	0	100000	8642	10336	10.0
7	Fish	0	80000	5079	7282	6
8	Dairy products	0	40000	5756	7025	6.6
9	Food oil	717	30,000	4665	3972	5.4
10	Sugar and sugar products	0	34,000	4620	4191	5.3
11	Tea, coffee and coca	0	30000	3533	4285	4.1
12	Cigarettes, tobacco and qat	0	90000	10870	15572	12.5
	Total	-	-	86636	-	100
	Monthly Income	17917	300000	103535	61398	-

Source: Data gathered through Primary Investigation

Table No. 5.10 presents the household income and expenditure on the major food groups in Yemen post-war period, where the average total monthly income of household amounted to 103, 535 Y.R, while the average total monthly expenditure of household was 86636 Y.R, which is 83.7 percent of the total monthly income.

Also from the above table, we can also see that the pattern of expenditure on food groups has not changed significantly during the post-war period, although there is a decrease in the average of expenditure for each food group, but relative importance of expenditure has changed as household tended to consume more rice compared to the pre-war period, where expenditure on rice comes in the first rank by 14.3 percent, followed by expenditure on grains, (group of

Cigarettes, tobacco, qat), meat, and vegetables with 13.2, 12.5, 10, and 8.7 percent respectively.

3.3. Estimation expenditure elasticities for major food groups in Yemen pre and post war

Table No.5.9 shows the expenditure elasticities for major food groups in Yemen pre-war period, where the expenditure elasticity estimates indicate that most of the food groups consumed are normal goods, that is, necessary food commodities. Expenditure elasticities for all food groups are statistically significant and positive, except for the fish; It recorded negative elasticity, which means that it is an inferior good. The (group of cigarettes, tobacco, and qat), which is a non-food group, but it recorded elasticity greater than 1, Therefore, it is considered a luxury goods.

Table 4: The expenditure elasticities for major food groups in Yemen pre-war

No	Food group	Expenditure Elasticities	t-value	Std. Error	Sig.
1	Grains and derivatives	0.96	8.3	0.074	.000
2	Rice crop	0.5	5.4	0.09	.000
3	Dried and preserved legumes	0.64	5.9	0.11	.000
4	Fresh and o vegetables	0.74	11.7	0.06	.000
5	Fresh and preserved fruits	0.80	6.6	0.12	.000
6	Meat	0.93	7.4	0.13	.000
7	Fish	- 0.3	-1.02	0.28	.311
8	Dairy products	0.75	5.3	0.14	.000
9	Food oil	0.63	14	0.05	.000
10	Sugar and sugar products	0.64	6.4	0.10	.000
11	Tea, coffee and coca	0.53	5.1	.10	.000
12	Cigarettes, tobacco and qat	1.5	3.7	0.41	.000

Source: Data gathered through Primary Investigation

According to the above table, certain food commodities recorded high expenditure elasticities, close to one, while others recorded low ones as follow:

- There are statistically significant differences for the elasticities of all food groups, where the significance value was less than 0.001, except for fish, which not statistical significance because the significance value amounted to 0.311, which is greater than 0.05.
- The elasticity of expenditure recorded high values and close to 1 for each of the grains, meat, fruits, dairy and vegetables, which amounted to 0.96, 0.93, 0.80, 0.75, 0.74 for each commodity, respectively.
- On the other side, the elasticity of expenditure recorded low values for Dried and preserved legumes, rice, food oil, sugar and tea, where the elasticity value ranged between 0.64-0.5.
- It is interesting that the elasticity of expenditure on fish was negative, i.e. -0.3, which means that it is an inferior commodity from the respondents' point of view, as the higher the household's income, the lower its expenditure on fish, because the households tend to eat other foods than fish.
- The (group of cigarettes, tobacco, and qat), is a non-food group, but that recorded a high expenditure elasticity of 1.5, and this means that it is a luxury good because its elasticity value is greater than the 1.

On the other hand, the table below No. 5. refer the expenditure elasticities for major food groups in Yemen

post-war period, where the elasticity decreased for most food groups compared to the pre-war period, which can be summarized as follows:

- The values of elasticities after the war achieved statistically significant differences, where the significance value was less than 0.001 for each of the grains, vegetables, fruits, meat, dairy products, food oil, sugar, and Tea, coffee and cocoa, but the differences were not statistically significant for the crops of rice, legumes and fish, where the significance value reached 0.259, 0.174, 0.179 which is greater than the 0.05 significance level.
- Income elasticity recorded a noticeable decrease for each of cereals, legumes, fruits, meat, dairy products and sugar, where the elasticity ranged between 0.2 - 0.6, which means if income is increased by one percent, the response of expenditure on food groups will increase by a value of elasticity for each food group separately.
- The expenditure elasticity of the rice crop decreased from 0.5 before the war to 0.14 during the war, that mean, if income is increased by one percent, the response of expenditure on rice crop just to increase by 0.14 compared to the response change which reached 0.5 in pre-war period.
- The expenditure elasticity of cereals recorded a decrease from 0.96 before the war period to 0.3 during the war, that mean, if income is increased by one percent, the response of expenditure on cereals will to increase by 0.3

compared to the response change which reached 0.96 in pre-war period.

Table 5: The expenditure elasticities for major food groups in Yemen post-war

No	Food group	Expenditure Elasticities	t-value	Std. Error	Sig.
1	Grains and derivatives	0.3	2.6	0.116	.011
2	Rice crop	0.14	1.13	0.122	.259
3	Dried and preserved legumes	0.2	1.4	0.144	.174
4	Fresh and o vegetables	0.52	5.71	0.091	.000
5	Fresh and preserved fruits	0.35	3.7	0.094	.000
6	Meat	0.6	3.73	0.157	.000
7	Fish	0.5	1.35	0.363	.179
8	Dairy products	0.5	2	0.248	.047
9	Food oil	0.4	4.6	0.080	.000
10	Sugar and sugar products	0.25	2.14	0.118	.034
11	Tea, coffee and coca	0.3	2.1	0.134	.038
12	Cigarettes, tobacco and qat	0.9	1.4	0.640	.175

Source: Data gathered through Primary Investigation

- It is important to note that the income elasticity of fish achieved a positive elasticity value of 0.5 Compared to negative elasticity which amounted -0.3 in pre-war period, and it turned from a inferior commodity pre-war period to a necessary commodity during the war, because the decline in household income made households tend to consume fish due to the lower prices of some types of fish compared to meat.

Also, according to the table above we note the elasticity of income for (group of cigarettes, tobacco, and qat), as a non-food group but it recorded a decrease in elasticity from 1.5 as a luxury commodity in pre-war period to 0.9 as a normal good during the war period.

4. Conclusion

The primary objective of this paper is to estimate the elasticities of expenditure on major food group pre and post war through a personal interview by a questionnaire form for a random sample consisting of 200 households during the month of October 2021 year in four Yemeni governorates, namely Sana'a, Ibb, Hadhramaut, and Aden, where then estimated expenditure elasticity for the 12 most important food groups And one non-food group is (group of cigarettes, tobacco, and qat), as it represents an important percentage of a household's daily expenditures.

The list of the major food groups in Yemen was adopted according to the published reports on household budget surveys issued by the Ministry of Planning, except for the rice crop that was added because it was not on the list since Yemen does not produce rice crop, and all rice consumed is imported.

Results study showed that the average household income decreased from 129, 220Y.R pre-war to 103, 535Y.R post-war, which represents a decline of about 19.9 percent. The average household expenditure on food also decreased from 107, 449Y.R pre-war to 86, 636Y.R post-war, which represents a decline of about 19.4 percent.

The expenditure elasticities estimates in post-war recorded a decrease for all food groups compared to the pre-war period, except for the expenditure elasticity of fish, which

increased from -0.3 as an inferior good in pre-war to 0.5 as a necessary good after the war. And the expenditure elasticity of the rice crop decreased from 0.5 before the war to 0.14 during the war.

The income elasticity of cereals recorded decrease from 0.96 to 0.3. Finally, the expenditure elasticity on (group of cigarettes, tobacco, and qat), as a non-food group achieved a decrease from 1.5 as a luxury good before the war to 0.9 as almost a normal good post war period.

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