J. Agric. Sci. Technol. (2024) Vol. 26 (6): 1227-1243

Meat Demand Structure and Welfare Effects of Price Liberalization: Toward Socio-Demographic Policy Recommendations

Gh. Layani[1*], and M. Karami-Dehkordi[1]

ABSTRACT

This study attempts to investigate the welfare effects of multiple meat price shocks, due to the price liberalization policy, in different consumers' income- and age-groups. This is achieved by using Compensating Variation welfare index (CV) and Hicksian price elasticities, based on the Almost Ideal Demand System (AIDS) and the cost-income data of 17931 urban households in Iran. The results showed that the difference in meat's own-price elasticity for consumers of different ages decreases with the improvement of consumers' income status. The absolute own-price elasticity of poultry varied between 0.072-0.559%. The highest sensitivity of poultry meat demand to price changes was observed in high-income consumer groups. As well as the red meat demand sensitivity to price changes for all age-groups declines along with the raised income. The fish own-price elasticity for all consumers was more than one, and their differences were more significant for low-income consumers. The CV index of consumers varied between 29% and 78% and confirmed the hypothesis of difference in the consumers' vulnerability in different age and income groups. Separating the welfare effect by consumer groups based on income and age indicated that low-income and younger consumers experienced a higher welfare loss compared to low-income and older consumers. Finally, to accurately target the subsidies, the government can pay a certain amount of subsidy to each person according to the economic and social characteristics to prevent the wastage of resources and reach the desired goal.

Keywords: Compensating variation, Food security, Government subsidy.

INTRODUCTION

Food price shocks can have a significant negative welfare effect on society, especially on poor and low-income households (Alem and Söderbom, 2012). Developing countries are more affected by food price fluctuations due to their economic structure. Because these countries are often in a period of economic transition, rising prices lead to many problems in these countries (Pawlak and Kołodziejczak, 2020). Iran is also one of the developing countries facing double-digit inflation rates for many years, and most of the government's efforts have always been focused on identifying and eliminating the roots of inflation (Ilias, 2010).

For various reasons, such as the nature of the agricultural sector, higher risk than other sectors, and food security, support for the agricultural sector has always been the focus of governments (Nematollahi *et al*., 2013; Ehlers *et al*., 2021). Government interventions in pricing, revenue protection, production control, customs restrictions on imports, and export subsidies to agricultural products are among the policies of governments to protect consumers and producers of agricultural products (Mockshell and Birner, 2015; Bellmann, 2019). Despite the positive effects of the

[1] Department of Management and Rural Development, Faculty of Agriculture, Shahrekord University, Islamic Republic of Iran.
* Corresponding author; e-mail: Ghasem.layani@sku.ac.ir

[DOI: 10.22034/JAST.26.6.1227]

liberalization of economic activity in the world, the Iranian government still has a significant contribution to the country's economy. However, almost all economists agree on the low efficiency of government economic activities. Restricting government intervention in agricultural activities is a measure suggested by the World Bank and other global economic organizations, especially in recent decades (Bakhshoodeh, 2002). The most important goals of market liberalization are to prevent the use of production facilities in the low-efficient production sector, increase production and encourage competition (Arya *et al*., 2018). About price liberalization, Tabatabaei and Asef (2021) examined how price liberalization affects energy consumption intensity. They found that price liberalization can enhance productivity, energy consumption management, and consumption reform, ultimately resulting in reduced energy intensity. Norouzi *et al*. (2021) conducted a study on how energy cost liberalization policies impact the cost-effectiveness of wind farms versus gas power plants. In food market, Dorosh *et al*. (2023) examined how market liberalization and global price fluctuations affect wheat price policies in Sudan. A study by Ghencea *et al*. (2022) found that liberalization and globalization in Moldova's food retail industry led to better access to high-quality food products and reasonable prices for consumers. Competition has also increased access and diversification. Iran's economic policies also try to diminish government hands and liberalize economic activities, especially in the agricultural market. Although this policy can bring economic benefits to society, its effects should also be taken into consideration by policymakers, and the liberalization policy should be well-defined and implemented.

To protect Iranian households from vulnerability caused by price liberalization, the government provides additional subsidies to consumers and eliminates cash subsidies for high-income groups. However, the success of this policy depends on accurately determining the appropriate amount of subsidies to be paid. To make well-informed decisions, policymakers must comprehend the potential impact of price shocks on household expenditure. Evaluating the impact of price shocks on consumer welfare can provide valuable insights into the effectiveness of government support policies aimed at reducing poverty and vulnerability (Layani *et al*., 2020). Based on microeconomics theories, whenever an economic change occurs (e.g. the price shocks) an individual moves from one equilibrium point to another equilibrium point. This means that they move from one indifference curve to another indifference curve. The change in welfare is measured by the difference in utility (Chipman and Moore, 1980). Economists try to convert changes in utility into observable indexes like money. Hicks (1942) defined Compensating Variation (CV) as the deduction (or addition) required from an individual's income to maintain the initial level of welfare (initial situation.) after a change in price and income. To calculate CV, estimating the demand functions and calculating the price and income elasticities of different goods for consumers in different groups play an essential role (Azzam and Rettab, 2012).

There is a large volume of published studies that worked on examining the structure of commodity demand and determining their price and income elasticities. Deaton and Mulbaer (1980) for Great Britain; Blanciforti *et al*. (1986) for the United States; Karagiannis *et al*. (2000) for Greece; Abdulai (2002) for Switzerland; Mazzocchi *et al*. (2004) for Italy; Tefera (2010) for Ethiopia; Ahn *et al*. (2018) for Korea; and Yuzbashkandi and Mehrjo (2020) for Iran are some examples. In recent years, there has been an increasing amount of literature on welfare effects and household vulnerability to price shocks in different countries (e.g., Fujii, 2013; Layani and Bakhshoodeh, 2016; Renner *et al*., 2019). The vulnerability of households in the United Arab Emirates (UAE) as a result

[DOI: 10.22034/JAST.26.6.1227]

of multiple price changes of imported food products was investigated by Azzam and Rettab (2012). The focus of this study was to determine the welfare effects of multiple commodity price changes. Recently, Layani *et al*. (2020) have evaluated the poverty line changes in urban households as a result of simultaneous price changes to understand the extent of Iranian consumers' vulnerability.

Considering all of this evidence, what is less clear is the different reactions of households with varying characteristics to changes in commodity prices. Consumers with varying income and age groups may react differently to price changes. This means that the price elasticity of consumers with different economic and demographic backgrounds can vary. The impact of price shocks on the welfare of consumers can be influenced by this issue. This issue was considered by Khoiriyah *et al*. (2019); Nikmatul *et al*. (2020); Kharisma *et al*. (2020); and Ur Rahman (2021). In these studies, the price and income elasticities of commodities were calculated in different income groups. Then, the welfare effects of price shocks for different groups of households were evaluated. Very little was found in the literature to consider the socio-demographic characteristics of households in the calculation of consumers' reactions to price shocks. Currently, by disentangling the impact of price shocks by household group according to income and age, Rossen *et al*. (2022) showed that lower-income and older households experience greater welfare losses and lower tax burdens than their income compared to lower-income and younger households. Also, Nur Hamzah (2022) found that regional heterogeneity plays an important role in explaining the most strategic food consumption pattern in Indonesia.

Research has shown that accurately calculating the impact of price changes on consumers with varying economic and demographic backgrounds can help governments develop targeted poverty reduction policies. To do this, it is important to understand consumer behavior in the market and calculate their price and income elasticity.

Therfore, this study set out with the aim of assessing the importance of socio-demographic characteristics and consumer demand structure in meat demand structure in Iran. This study takes into consideration the necessity of analyzing consumer behavior for different income and age groups. To the best of our knowledge, so far, this point has not been considered adequately. To enhance the government's cash subsidy payment policy, we need to assess the impact of price hikes on consumers' welfare, considering their income and demographic features. Therefore, In comparison to other studies, we report price and expenditure elasticities by socio-economic group. Finally, the welfare effects of the price shock caused by the price liberalization policy are evaluated for urban meat consumers in Iran, in different income and age groups.

MATERIALS AND METHODS

Welfare Index

There are various indexes for measuring welfare changes due to the implementation of different policies (Gohin, 2005). Compensated Variation (CV), is the adjustment in income that returns the consumer to the original utility after an economic change has occurred. EV is the adjustment in income that changes the consumer's utility equal to the level that would occur if the event had happened (Varian, 2000). According to the study by Azzam and Rettab (2012) and Tefera (2012), Compensated Variation was used in this study:

$$CV = \sum_{i=1}^{3} p_i^0 q_i^0 \left(\frac{dp_i}{p_i^0} + \frac{dx_i^*}{q_i^0} + \frac{dp_i}{p_i^0} \frac{dx_i^*}{q_i^0} \right) \quad (1)$$

Where, p_i^0 and x_i^0 correspond to price and quantities before price shock and dx_i^* is

[DOI: 10.22034/JAST.26.6.1227]

the compensated quantity change in demand following the price shock using the compensates elasticities. The percentage change of X_i^* is not available. However, by the total differential of the Hicksian demand functions $X_i^*(.)$ for i = 1, 2,. . ., N i.e., an approximation of the change is obtained.

$$\frac{dX_1^*}{X_1^0} = \epsilon_{11}^H \frac{dp_1}{p_1} + \epsilon_{12}^H \frac{dp_2}{p_2} + \cdots + \epsilon_{1N}^H \frac{dp_N}{p_N} \quad (2)$$

$$\frac{dX_2^*}{X_2^0} = \epsilon_{21}^H \frac{dp_1}{p_1} + \epsilon_{22}^H \frac{dp_2}{p_2} + \cdots + \epsilon_{2N}^H \frac{dp_N}{p_N}$$

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$$\frac{dX_N^*}{X_N^0} = \epsilon_{N1}^H \frac{dp_1}{p_1} + \epsilon_{N2}^H \frac{dp_2}{p_2} + \cdots + \epsilon_{NN}^H \frac{dp_N}{p_N}$$

Where, ϵ_{ij}^H is the Hicksian price elasticity for i = 1, 2,. . ., N and j = 1,2,. . ., N.

B) Hicksian Price Elasticities of Demand

To estimate the Hicksian price elasticities, an AIDS model for N commodities by imposing the usual restrictions: adding-up, homogeneity, and symmetry have been estimated (Deaton and Muelbauer, 1980). The AIDS model is:

$$S_{ih} = \alpha_i + \sum_{j=1}^{N} \gamma_{ij} log p_{jh} + \beta_i log\left[\frac{M_h}{f(p)}\right] + \vartheta_{ih} \quad (3)$$

Where S_{ih} is the expenditure share of meat groups i= 1, 2, 3 for household h; M_h is the household's total meat expenditure; P is a vector of prices and ϑ_{ih} denotes the error term. Also, f(p) is the Stone Price Index defined by $logf(p)_{ih} = \sum_i s_{ih} log p_{ih}$

We impose the theoretical properties of demand by:

Adding up: $\sum_{i=1}^{N} \alpha_i = 1;\ \sum_{i=1}^{N} \beta_i = 0;\ \sum_{i=1} \gamma_{ij} = 0$

Homogeneity of degree zero: $\sum_{i=1}^{N} \gamma_{ij} = 0; \quad i = 1.2 \ldots . N$

Symmetry: γ_{ij}=γ_{ij}

But, one of the problems we face when using cross-sectional data at the household level and dividing the food group into several smaller groups is the phenomenon of zero budget share. In other words, some households report zero consumption, and some others spend a non-zero share. Therefore, the variable is censored. To solve this problem, based on the Bakhshoodeh (2010) study, we use the following equation instead of Equation (3).

$$S_{ih} = \Phi_{ih}\left[\alpha_i + \sum_{j=1}^{N} \gamma_{ij} log p_{jh} + \beta_i log\left[\frac{M_h}{f(p)}\right]\right] + \theta_i \varphi_{ih} + \varepsilon_{ih} \quad (4)$$

Where Φ_{ih} is the cumulative distribution function, and φ_{ih} is the probability density function for a purchase in each product group per household. For calculating Φ_{ih} and φ_{ih} we have adopted the two-step approach from Shonkwiler and Yen (1999).

The respective formulas for computing the uncompensated own, and cross-price elasticities for N meat groups are as follows:

$$e_{iih}^M = \Phi_{ih}\left[\frac{\widehat{\gamma_{ii}}}{s_{ih}} - \hat{\beta}_i\right] - 1 \quad (5)$$

$$e_{ijh}^M = \Phi_{ih}\left[\frac{\hat{\gamma}_{ij} - \hat{\beta} s_{jh}}{s_{ih}}\right] \quad (6)$$

The formula for Income (expenditure) elasticities can be written as follows:

$$e_{ih} = \Phi_{ih}\frac{\hat{\beta}_i}{s_{ih}} + 1 \quad (7)$$

Compensated price-elasticities are as follows:

$$e_{ijh}^H = e_{ijh}^M + s_{jh}.e_{ih} \quad (8)$$

Data and Information

This study is based on an urban household's income-expenditure survey (2020) of the (Iranian Statistics Center 2020) (17931 urban households) for computing price and expenditure elasticities. To define the price increase scenario, the information related to the price of various types of meat and the inflation index of food prices in Iran were reviewed. The food price inflation in Iran was 7.98% in January 2010, which increased to 42.79% in 2022. The average annual change of this index is 57.46%. Examining the cost-income information of Iranian urban households shows that 21%

[DOI: 10.22034/JAST.26.6.1227]

of the total food expenditure is devoted to meat. So that the share of red, poultry, and fish meat from the total food expenditure is equal to 11.31, 7.41, and 2.23%, respectively (Iranian Statistics Center, 2020). The producer price index of the meat group had an upward trend during 2010-2021 (FAO, 2022). The average annual growth of this index over the past decade is 26.80%. Considering the 27% share of food expenditure from the total household expenditure, it is expected that this food price inflation will have adverse welfare effects on Iranian households (Iranian Statistics Center, 2020). We have gathered data on meat prices before and after the liberalization of prices and the decrease in subsidies for agricultural inputs. According to our statistics, there has been an upward trend in meat prices in Iran in recent years. Specifically, the increases were 35.9% for red meat, 68.4% for poultry, and 77.7% for fish (Iranian Statistics Center, 2022). In this study, to investigate the welfare effects of the price shock in the Iranian meat market for Iranian households, the changes in the meat price have been defined as a price shock scenario to calculate the changes in the expenditure of consumers in different age and income consumer groups.

RESULTS

Meat Demand Data and Descriptive Statistics

The share of poultry expenditure for younger consumers in the low-income group is more than the other meat groups (Table 1). As the age of the consumer in this group increases, the poultry expenditure share is reduced, while the red and fish expenditure share is increased. For younger consumers, the red and fish expenditure share is estimated to be below 10%. The share of poultry expenditure is more than the share of red meat and fish in the second income group. However, compared to the first income group, the share of poultry expenditure is at a lower level and the share of red meat and fish expenditure is at a higher level. The results show that, for different age groups of consumers in these two income groups, fish is not the priority of consumption. By moving from the first to the second income group, poultry expenditure share is reduced and red meat expenditure share is increased. With the increase in income, in the third income group, the share of red meat expenditure increases noticeably, so that for young consumers, the share of red meat expenditure increases to 33% and the share of poultry expenditure decreases to 56%. For consumers aged 20-40 years, the share of red meat expenditure exceeds the share of poultry meat expenditure and reaches 52%. For the 41-60 years age group, the expenditure share of red, poultry, and fish meat is equal to 52, 44, and 4%, respectively. For the elderly, it is more important to consume poultry meat than red meat and fish. With the increase in the age of consumers in the high-income group, the expenditure share of red meat has increased and reached 65% for people over 61 years old. The expenditure share of fish meat also indicates less consumption of this type of meat than red meat and poultry in this income group.

B. Demand Elasticity across Socio-Demographic Groups

We divided households along socio-demographic characteristics and calculated price and income elasticities to consider the effects of price liberalization. Key questions were the impact of meat price shocks on different income and age groups. Accordingly, we derived and compared elasticity values for (1) Low-income, middle-income, relatively high-income, and high-income households, and (2) Four age group households. All own-price elasticities of meats were negative. In terms of absolute values, the highest own-price elasticity was related to fish, and the lowest

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Table 1. Social characteristics and share of meat types among the urban consumers.

Household income specification	Age profile years	Meat Type	Household meat expenditure share (%)	Per capita consumption (Kg/month)	Number of households	Average education (year)	Average household size
Low Income	Age≥25	Red meat	0.035	0.009	62	10.72	3.16
		Poultry	0.949	0.641			
		Fish	0.016	0.011			
	26≤ Age≤ 40	Red meat	0.040	0.012	1529	9.77	3.89
		Poultry	0.917	0.751			
		Fish	0.044	0.018			
	41≤ Age≤ 60	Red meat	0.067	0.022	1706	7.94	4.34
		Poultry	0.896	0.747			
		Fish	0.038	0.018			
	Age<= 25	Red meat	0.034	0.013	573	3.47	3.55
		Poultry	0.933	0.819			
		Fish	0.033	0.015			
Middle Income	Age≥ 25	Red meat	0.120	0.079	58	9.18	2.66
		Poultry	0.850	1.498			
		Fish	0.030	0.029			
	26≤ Age≤ 40	Red meat	0.259	0.154	1456	10.54	3.63
		Poultry	0.689	1.237			
		Fish	0.052	0.063			
	41≤ Age≤ 60	Red meat	0.283	0.167	1912	8.65	3.95
		Poultry	0.668	1.167			
		Fish	0.049	0.058			
	Age => 61	Red meat	0.177	0.133	876	3.49	2.94
		Poultry	0.796	1.325			
		Fish	0.026	0.042			
Relatively high income	Age <= 25	Red meat	0.338	0.416	60	10.88	2.46
		Poultry	0.562	2.159			
		Fish	0.101	0.313			
	26≤ Age≤ 40	Red meat	0.518	0.589	1379	11.65	3.47
		Poultry	0.419	1.617			
		Fish	0.064	0.156			
	41≤ Age≤ 60	Red meat	0.517	0.498	1987	9.54	3.83
		Poultry	0.439	1.388			
		Fish	0.044	0.091			
	Age => 61	Red meat	0.441	0.463	1041	4.48	2.90
		Poultry	0.512	1.536			
		Fish	0.047	0.101			
High Income	Age <= 25	Red meat	0.617	1.558	64	11.58	2.22
		Poultry	0.318	2.133			
		Fish	0.064	0.333			
	26≤ Age≤ 40	Red meat	0.651	1.425	1188	12.87	3.11
		Poultry	0.283	1.933			
		Fish	0.066	0.292			
	41≤ Age≤ 60	Red meat	0.660	1.575	2289	1.64	3.34
		Poultry	0.289	2.142			
		Fish	0.051	0.258			
	Age => 61	Red meat	0.656	1.923	1752	6.10	2.32
		Poultry	0.310	2.709			
		Fish	0.034	0.208			

[DOI: 10.22034/JAST.26.6.1227]

own-price elasticity was related to poultry. There was a competitive (and complementary) relationship between commodities if cross-price elasticities are positive (and negative). The cross-price elasticities presented in Table 2 also show that red meat and fish have a competitive relationship together, while red meat and poultry are competitive. This study supports evidence from previous observations (e.g. Roosen *et al*., 2022 and Kharisma *et al.,* 2020; Khoiriyah *et el*., 2020).

Looking at the age profile (Figure 1), it becomes apparent that the differences in reaction to price changes for different age categories. The sensitivity of red meat demand to price changes in the age group between 26 to 40 and 41 to 60 years is more than in the other age groups. The own price elasticity of red meat for the middle-aged low-income group is more than for the young and very old-age groups. With the increase in income, the absolute value of the red meat own-price elasticity increases for consumers under 25 years old and over 60 years old, and decreases for consumers between 25 and 60 years old. According to the result, the red meat demand sensitivity to price changes for all age groups decreases along with increased income.

Examining the own-price elasticity of poultry meat in different income and age groups indicates that the highest sensitivity of demand to price changes is related to households with high income. The absolute price elasticity of poultry meat for consumers varies between 0.072% and 0.559%. By moving towards lower-income groups, the difference in price elasticities of poultry meat increases in different age groups. The highest absolute price elasticity of poultry meat is related to age groups 26-40 and 41-60 years old. The own-price elasticity of fish meat for low-income households is higher than for high-income groups. In the low-income group, younger consumers have the highest absolute price elasticity and the consumers in the 26-40 age group have the lowest absolute price elasticity.

The expenditure elasticity of red meat varies between 1.906 and 1.489% for low-income consumer groups (Figure 2). The highest and lowest expenditure elasticity in this group is related to people under 25 years old and 26-40 years old, respectively. The sensitivity of red meat demand to income changes for low-income households is higher than in other groups. By moving towards higher income groups, the amount of expenditure elasticity decreases. Also, for all income-age groups of people, the expenditure elasticity of red meat is higher than one, which shows that red meat is considered a luxury good.

The expenditure elasticity of poultry meat for di[Red meat]-age groups is positive and small Figure 3). Therefore, this type of meat is considered an essential good. For younger people, the expenditure elasticity of poultry meat varies between 0.214 and 0.720%. In general, with the increase in income, the sensitivity of poultry meat demand to changes in income decreases. In the high-income group, the expenditure elasticity of people over 61 years old is equal to 0.077% and for people under 25 years old, it is equal to 0.214%. Meanwhile, in the low-income group, the expenditure elasticity of people over 61 and under 25 years old is equal to 0.728 and 0.716%, respectively.

Based on the expenditure elasticity of fish meat, this type of meat is considered a luxury good. In the low-income group of consumers, the highest and lowest expenditure elasticity was obtained for people over 60, and 41-60 years old. With the increase in income, the expenditure elasticity of fish meat for people over 60 years old decreases to 1.106%. For younger consumers, the expenditure elasticity of fish meat varies between 1.18% (low-income group) and 1.098% (high-income group).

C. Welfare Effect of Multiple Price Shock

The welfare effects of meat price increased as a result of the price liberalization policy (Table 3). For different age groups, along with the increase in consumer income, meat

[DOI: 10.22034/JAST.26.6.1227]

Table 2. Hicksian price elasticity of meat in different income-age consumer groups. [a]

Household Income Specification	Age profile years	Meat Type	Red meat	Poultry	Fish
Low Income	Age <= 25	Red meat	**-0.284**	-1.918	0.670
		Poultry	-0.247	**-0.136**	0.345
		Fish	1.853	3.554	**-5.408**
	26≤ Age≤ 40	Red meat	**-0.310**	-1.562	0.529
		Poultry	-0.253	**-0.251**	0.447
		Fish	0.937	1.873	**-2.810**
	41≤ Age≤ 60	Red meat	**-0.372**	-1.070	0.388
		Poultry	-0.224	**-0.294**	0.433
		Fish	1.168	2.067	**-3.235**
	Age => 61	Red meat	**-0.218**	-2.065	0.682
		Poultry	-0.262	**-0.207**	0.428
		Fish	1.264	2.526	**-3.790**
Middle Income	Age <= 25	Red meat	**-0.354**	-1.111	0.422
		Poultry	-0.145	**-0.072**	0.402
		Fish	1.141	2.199	**-3.058**
	26≤ Age≤ 40	Red meat	**-0.308**	-0.978	0.360
		Poultry	-0.305	**-0.231**	0.609
		Fish	1.155	1.940	**-2.864**
	41≤ Age≤ 60	Red meat	**-0.269**	-0.969	0.389
		Poultry	-0.219	**-0.212**	0.515
		Fish	1.282	2.113	**-3.148**
	Age => 61	Red meat	**-0.282**	-1.195	0.464
		Poultry	-0.122	**-0.103**	0.402
		Fish	1.069	1.992	**-2.775**
Relatively high income	Age <= 25	Red meat	**-0.247**	-0.501	0.223
		Poultry	-0.261	**-0.326**	0.666
		Fish	1.151	1.530	**-2.358**
	26≤ Age≤ 40	Red meat	**-0.206**	-0.466	0.240
		Poultry	-0.481	**-0.448**	0.781
		Fish	1.341	1.631	**-2.781**
	41≤ Age≤ 60	Red meat	**-0.202**	-0.506	0.257
		Poultry	-0.458	**-0.439**	0.747
		Fish	1.355	1.672	**-2.848**
	Age => 61	Red meat	**-0.203**	-0.531	0.264
		Poultry	-0.318	**-0.365**	0.662
		Fish	1.199	1.515	**-2.451**
High Income	Age <= 25	Red meat	**-0.174**	-0.398	0.209
		Poultry	-1.181	**-0.522**	1.199
		Fish	1.313	1.371	**-2.571**
	26≤ Age≤ 40	Red meat	**-0.150**	-0.410	0.218
		Poultry	-1.005	**-0.560**	1.110
		Fish	1.401	1.463	**-2.762**
	41≤ Age≤ 60	Red meat	**-0.138**	-0.440	0.233
		Poultry	-1.030	**-0.559**	1.110
		Fish	1.412	1.474	**-2.793**
	Age => 61	Red meat	**-0.131**	-0.439	0.241
		Poultry	-0.883	**-0.545**	1.012
		Fish	1.291	1.292	**-2.471**

[a] The bold number is Hicksian own-price elasticity

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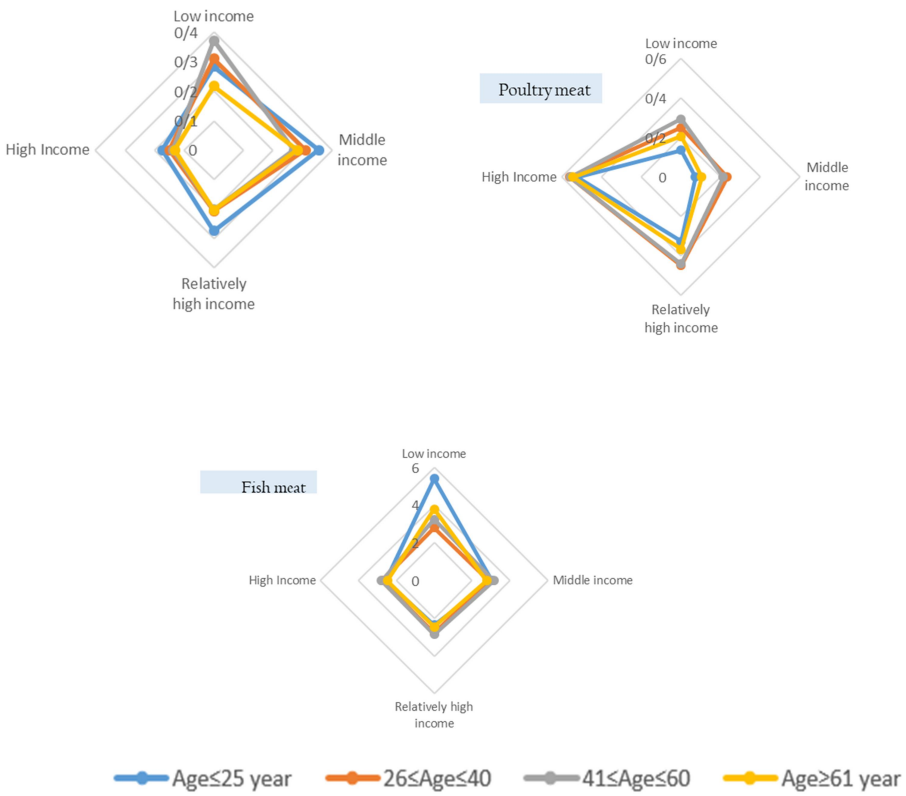
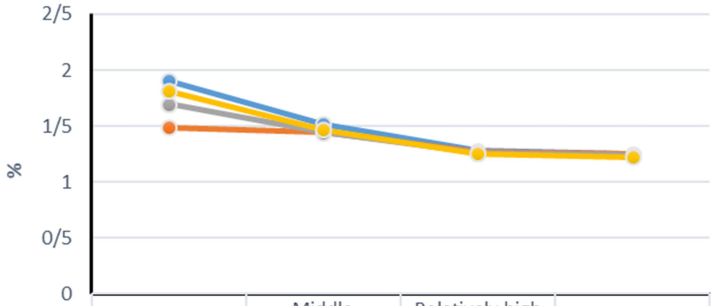


Figure 1. The absolute value of own-price elasticity.



	Low income	Middle income	Relatively high income	High Income
Age≤25 year	1/906	1/517	1/277	1/249
26≤Age≤40	1/489	1/445	1/27	1/25
41≤Age≤60	1/699	1/44	1/258	1/239
Age≥61 year	1/815	1/468	1/255	1/225

Figure 2. Expenditure elasticity of red meat for different income-age groups.

expenditure changes increased due to the price shock. The CV index for young people in different income groups varies between 30.58 and 69.80%. In more detail, for the consumer under 25 years old, the CV index in the low-income group is equal to 69.80%

[DOI: 10.22034/JAST.26.6.1227]

per person, and this index decreases to 30.58% for high-income consumers. With the increase in the age of consumers to 26-40, the CV index decreased for most income groups. The change in consumer meat expenditure due to the price shock varies between 29.27 and 70.76% in this age group of consumers so that for high and relatively high-income groups, the CV index is equal to 29.27% and 38.26%, respectively. For the 41-60 years age group, as a result of the simultaneous meat price increase, 62.18, 50.59, 38.04, and 29.25% will be added to the initial consumer meat expenditure. Finally, for old consumers, the CV index in different income groups varies in the range of 32.06-70.39%. The biggest change in expenditure happens to consumers with low income. On average, younger Iranian urban consumers need to be compensated with approximately 58.54% of the initial meat expenditure to accommodate the adverse impact of food price changes they faced due to price liberalization. This index, on average, is equivalent to 52.02% for older consumers.

DISCUSSION

In this paper, we have investigated the welfare effect of multiple price shocks, as a result of agricultural market liberalization, for urban households in Iran. An initial objective of the study was to identify the price and expenditure elasticity of meat in different income and age groups of consumers. Therefore, both the price and expenditure elasticities of meat are evaluated for consumers grouped into four income groups as well as four age groups. Analysis of the data obtained from the Iranian Statistics Center (2021) showed that the poultry expenditure's share for most income groups is higher than the share of red meat and fish. This result may, therefore, point to the effect discussed by Cotterill and Samson (2002) and Rossen *et al*. (2022) that low-income households may be already buying a type of meat with lower price. In the lower income groups, as consumer age, the poultry expenditure's share decreases, and the red meat expenditure's share increases. For consumers in the third quartile, by increase in age, the consumer's tendency to consume red meat increases. The current study found that the sensitivity of high-income households' poultry meat demand is higher than lower-income households. This finding was also reported by Rossen *et al*. (2022). On the contrary, for red and fish, low-income households react more elastically to price changes compared to high-income households. This finding is consistent with Ni Mhurchu *et al*. (2013) for New Zealand, who reports higher own-price elasticities in low-income groups. Another important finding was that the difference in price elasticities between different age groups of consumers is noticeable. For instance, by moving toward low-income groups, the difference in price elasticities of poultry meat increases in different age groups. As well as, the sensitivity of red meat demand to price changes in the age group between 26 to 40 and 41 to 60 years is more than in the other age groups. It is interesting to note that in all absolute own-price fish elasticities for the different age and income groups are more than one. For high-income consumers, the absolute value of the fish's own-price elasticities is reduced. Considering the importance of fish meat consumption for age groups over 60 years old, it can be expected that a price shock in the meat market can have a significant impact on the demand for fish meat and people's health. Another important finding was that the expenditure elasticity of red and fish meat for urban households in Iran is greater than one. This implies a fairly large response of demand for these food groups to changes in total food expenditure. Therefore, these types of meat are considered luxury goods. These results agree with those obtained by Layani *et al*. (2020) for Iran and Syrovátka (2007) for Czech. We also obtain higher red meat expenditure elasticities for younger households compared to older households. The estimated expenditure elasticity of

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Table 3. Per-capita welfare effect of multiple meat price shocks.

Age profile	Welfare index	Low Income	Middle Income	Relatively high income	High Income
Age <= 25	Initial meat expenditure (USD)	3.37	8.28	19.41	38.28
	CV (%)	69.80	78.24	55.06	30.58
26≤ Age≤ 40	Initial meat expenditure (USD)	3.71	8.57	18.13	35.16
	CV (%)	70.76	56.64	38.26	29.27
41≤ Age≤ 60	Initial meat expenditure (USD)	3.85	8.53	15.03	38.13
	CV (%)	62.18	50.59	38.04	29.25
Age => 61	Initial meat expenditure (USD)	3.95	8.58	15.29	46.04
	CV (%)	70.39	61.20	44.44	32.06

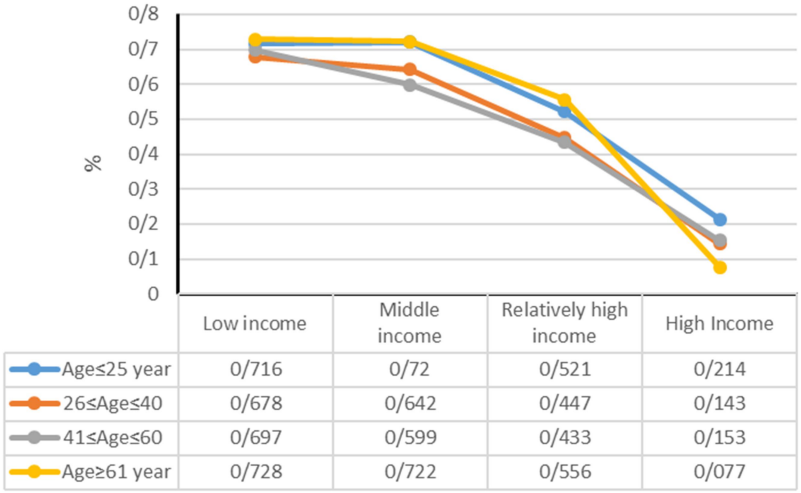


Figure 3. Expenditure elasticity of poultry for different income-age groups.

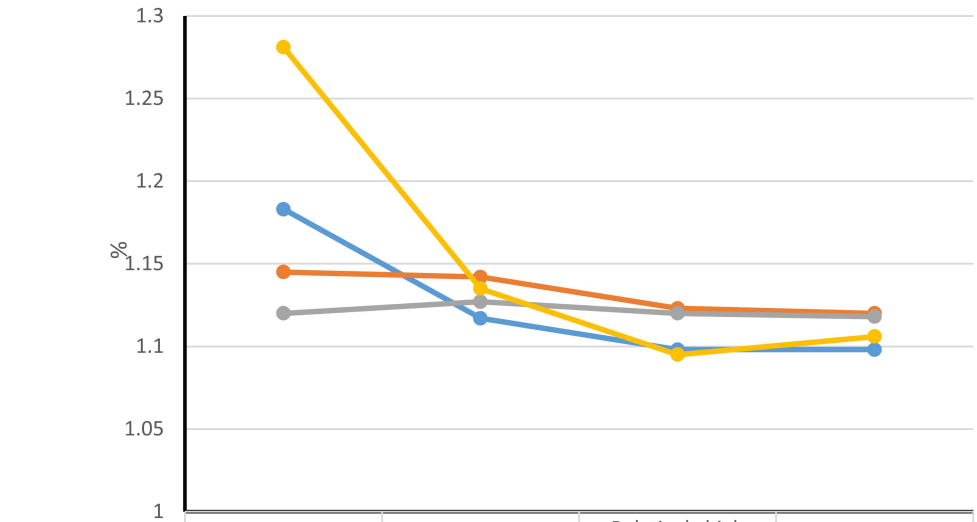
poultry is less than unity, so, this good is fairly inelastic concerning total food expenditure. For most income groups, the results of this study show that poultry expenditure elasticity is higher for older consumers compared to younger consumers, although this difference is not very evident. Akin *et al*. (2019) also concluded a statistically significant relationship exists between gender, income level, monthly food budget, and the amount of monthly budget allocated to meat.

It is interesting to note that the difference in welfare effects of meat price shocks is noticeable among different income groups. The greatest CV is related to high-income groups and the lowest is related to lower-income consumers. The low-income consumer already consuming lower meat, therefore, the change in meat expenditure as a result of its price shock for these consumers is less than for high-income consumers. But the change in expenditure due to the price shock for low-income

[DOI: 10.22034/JAST.26.6.1227]

consumers accounts for a larger share of these consumers' total meat expenditures. Therefore, these consumers are more vulnerable than higher-income consumers. Also, the CV index increases as the age of consumers increases. This finding was also reported by Rossen *et al*. (2022). Tekindal *et al*. (2020) showed that the quality of life has a significant relationship with the increase in the monthly income of students. Increased income was associated with improved scores on physical role limitation, emotional role limitation, energy/spirit/vigor, mental health, bodily pain, and general health perception. This statistically significant improvement must be arising out of the rising level of welfare.

The results of CV suggest that Iranian urban consumers need to be compensated with approximately 29-78% to accommodate the adverse impact of meat price changes as a result of price liberalization. The lowest value of the CV index is related to the high-income consumers between 41-60 years old, and the highest CV index is for middle-income consumers under 25 years old. Generally, meat price shocks have had differential effects on consumers of different ages and incomes. The results of this study can be effective for planning to support vulnerable households in the society. In the last 40 years, one of the most important consumer protection policies in Iran has been the payment of subsidies for goods and services. This policy was implemented with the aim of controlling and stabilizing prices, supporting vulnerable groups, reducing poverty, and distributing income fairly. But in recent years, there have been many criticisms of this policy and its implementation. Despite the implementation



	Low income	Middle income	Relatively high income	High Income
Age≤25 year	1.183	1.117	1.098	1.098
26≤Age≤40	1.145	1.142	1.123	1.12
41≤Age≤60	1.12	1.127	1.12	1.118
Age≥61 year	1.281	1.135	1.095	1.106

Figure 4. Expenditure elasticity of fish for different income-age groups.

[DOI: 10.22034/JAST.26.6.1227]

of this policy since 1970, the poverty rate in Iran is still high and this policy has not been able to have the necessary effectiveness in reducing poverty and food security. As such, this instrument is seen as inefficient, given its high budget costs, as a potential source of market distortions, and as benefitting some groups who do not need to be supported (e.g. target groups are not identified and households receive the same subsidy) (Azzam and Rettab, 2012; Bakhshoodeh, 2010; Tefera, 2012). The subsidy payments of 1.56 USD per month for each person have been constant without considering inflation over the last two decades. These untargeted subsidy payments to the households, regardless of considering their vulnerability and their income level, in addition to being costly for the government, do not improve welfare indicators at the national level. Identification of vulnerable households and determining the amount of subsidy paid to the target groups is one of the most important challenges that policymakers in Iran are facing. In this regard, after the implementation of the price liberalization policy, the government pays $13.92 per person for the first three income deciles and $10.44 per person for the next six deciles and removes the tenth income decile from receiving direct subsidies. This direct payment to consumers is the same for different people with different social characteristics. The results of the present study showed that the level of vulnerability of consumers in different social-economic groups is different from each other. Therefore, to accurately target the subsidies, the government can pay a certain amount of subsidy to each person according to the economic and social characteristics to prevent the wastage of resources and reach the desired goal. In the same way, to achieve goals such as food security and reducing welfare losses caused by price shocks, it is necessary to implement policies such as increasing wages and paying subsidies to vulnerable households. Of course, it is necessary to consider the inflationary effects of the implementation of these policies.

Finally, to reduce the vulnerability of low-income households, it is necessary to identify the factors affecting the price of meat, so that food price shocks can be avoided through appropriate policies. Controlling exchange rate fluctuations, and thus the price of imported inputs (Mat *et al*., 2020; Arikan *et al*., 2022) can play an effective role in controlling meat price shocks in the agricultural market. Domestic market prices of feed raw materials interact with the global market at the dollar exchange rate. Knowing the direction of the relationship between the price of the product and the price of input in animal husbandry would lead to adopting effective courses of action and forming efficacious policies to support the industry beginning from the sub-industries.

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ساختار تقاضای گوشت و اثرات رفاهی آزادسازی قیمت: به سمت توصیه‌های سیاست اجتماعی - جمعیتی

ق. لیانی، و م. کرمی دهکردی

چکیده

این مطالعه به بررسی اثرات رفاهی شوک های متعدد قیمت گوشت در گروه های مختلف درآمدی و سنی مصرف کنندگان به دلیل سیاست آزادسازی قیمت می پردازد. این امر با استفاده از شاخص رفاه تغییرات جبرانی (CV) و کشش‌های قیمت هیکسین، بر اساس سیستم تقاضای تقریبا ایده‌آل (AIDS) و داده‌های هزینه-درآمد ۱۷۹۳۱ خانوار شهری در ایران به دست می‌آید. نتایج نشان داد که تفاوت کشش قیمتی خود گوشت برای مصرف کنندگان در سنین مختلف با بهبود وضعیت درآمدی مصرف کنندگان کاهش می یابد. کشش قیمتی مطلق طیور بین ۰.۰۷۲-۰.۵۵۹ درصد متغیر بود. بیشترین حساسیت تقاضای گوشت طیور به تغییرات قیمت در گروه های مصرف کننده پردرآمد مشاهده شد. همچنین حساسیت تقاضای گوشت قرمز به تغییرات قیمت برای همه گروه های سنی همراه با افزایش درآمد کاهش می یابد. کشش قیمت خود ماهی برای همه مصرف‌کنندگان بیش از یک بود و تفاوت آن‌ها برای مصرف‌کنندگان کم‌درآمد بیشتر بود. شاخص CV مصرف کنندگان بین ۲۹ تا ۷۸ درصد متغیر بود و فرضیه تفاوت در آسیب پذیری مصرف کنندگان در گروه های سنی و درآمدی مختلف را تأیید کرد. تفکیک اثر رفاه بر اساس گروه‌های مصرف‌کننده بر اساس درآمد و سن نشان داد که مصرف‌کنندگان کم‌درآمد و جوان‌تر نسبت به مصرف‌کنندگان کم‌درآمد و مسن‌تر از دست دادن رفاه بیشتری را تجربه می‌کنند. در نهایت برای هدفمندسازی دقیق یارانه ها، دولت می تواند با توجه به

[DOI: 10.22034/JAST.26.6.1227]

ویژگی های اقتصادی و اجتماعی به هر فرد مبلغ مشخصی یارانه پرداخت کند تا از هدر رفت منابع جلوگیری کرده و به هدف مورد نظر برسد.

[DOI: 10.22034/JAST.26.6.1227]