

2 **Economies of Scale of Household Consumption Expenditure in Iran**

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7  
8 **ABSTRACT**

9 Household-scale economics can plausibly be attributed to shared household public goods that make  
10 larger households better off at the same level of per capita resources. This paper examines the role  
11 of food and housing in the allocation of Iranian household expenditure, considering co-residence  
12 and economies of scale. Using a seemingly unrelated regression model for 2011 and 2021, we  
13 predict that in the presence of shared food and housing, our method (solely) exploits preference  
14 information revealed by a cross-section of household observations while accounting for fully  
15 unobserved preference heterogeneity. Our findings indicate that scale economies changed  
16 significantly from 2011 to 2021 for expenditure categories of food and housing, but not all trends  
17 in scale economies are consistent with theoretical predictions. The results show that economies of  
18 scale are recognized to be higher in the housing group than in the food group in both periods.  
19 However, it has decreased within a decade and intensified due to the lack of appropriate  
20 government policy. In this context, the government's policies to encourage population growth have  
21 failed, and the population has encountered a low growth rate. Thus, providing support and welfare  
22 policy packages such as increasing income policy and household support insurance, as well as  
23 assistance in providing housing, are prioritized due to the economies of scale in housing.

24 **Keywords:** Economies of Scale, Household Consumption, Welfare, Food, Housing, Iran

25  
26 **INTRODUCTION**

27 The population and its desirable growth have been discussed as a main and highly influential factor  
28 in the development and progress of any country. In this context, the fundamental question is what  
29 direct and indirect approaches and policies should be adopted by politicians to increase (control)  
30 the population according to the prevailing conditions and to reach maximum productivity and  
31 social welfare.

32 Population heterogeneity occurs all over the world more than before at the beginning of the 21<sup>st</sup>  
33 century and the world is facing a wide range of population issues and socio-economic challenges.  
34 The issues related to population have occupied the human mind for a long time. Politicians and  
35 thinkers have always discussed issues such as the desired population size, the necessity of adopting  
36 population increase policies, or population control by considering the political, military, economic,  
37 and social considerations. Is a large population an opportunity or a threat to a country? What  
38 should be the desired annual population growth rate for a country? Should we merely pay attention  
39 to the quantitative growth of the population or should we consider the qualitative growth as well?  
40 And what population policies should be adopted for each country? These are among the questions  
41 that have always been considered by different groups such as economists and politicians.

42 The supply of basic needs such as food and housing depending on the per capita expenditure of the  
43 household, the price of food and housing, and their budget share in the household are the most  
44 important prerequisites for the population growth or the household size in Iran. However, the  
45 growth rate of Iran's population increased from 1.3% in 2011 to 0.57% in 2021 and the average  
46 household size decreased from 4 to 3 people. In addition, it is predicted that the population will  
47 experience negative growth in the next two decades (SCI, 2022). Based on the FAO Food Price  
48 Index, the price of food has increased from 1.98 in 2020 to 7.125 in 2021 (FAO, 2022). In this  
49 regard, households pursue their future decisions on having children based on their expenditure  
50 share relative to the change in food and housing prices, which will affect the population policies of  
51 the country. Hence, one of the basic questions is related to the way households react to the  
52 consumption of basic goods such as food and housing due to the changes in household size.

53 Consumption is considered one of the key concepts in macroeconomics, which plays a critical role  
54 in improving the quality of life and the level of well-being in society as the largest and most stable  
55 component of the Gross National Production and the most significant component of the household  
56 expenditure. In general, it is assumed that the consumption of a particular product by the members  
57 of the household is the same, and the amount consumed by the household is divided by the number  
58 of members of that household to calculate the per capita consumption of a food item in the  
59 household. This method indicates the average consumption of the household and a general  
60 understanding of this phenomenon at the household level. Such an attitude cannot provide data on  
61 the nature and manner of consumption of each family member about each other due to their age

62 and gender differences. The consumption of a food item by household members depends on the  
63 household size, as well as the age and gender of the household members (Kakwani et al., 2005).  
64 Economies of scale in production have mainly been considered in economics, however,  
65 consumption has an important position in the field of welfare economics and has created a new  
66 horizon in this field according to the above-mentioned factors. In this way, if we regard more  
67 prosperity simply in the form of more use of goods and services, the presence of economies of  
68 scale can provide the possibility of joint use of goods and services. The joint use of goods and  
69 services increases the potential for the usefulness of such goods and services without the need to  
70 increase the amount of goods and services. In this regard, economies of scale through capacity  
71 building lead to higher welfare for the consumer. In welfare economics, economies of scale are an  
72 obvious example of the effect of household size on household welfare. Defining welfare as more  
73 use of goods and services, the diseconomies of scale in housing and food cannot provide the  
74 possibility of joint use of other goods and services. The joint use of goods and services increases  
75 the potential of creating the usefulness of such goods and services without the need to increase the  
76 amount of goods and services. If there is no increase in desirability and welfare in Iranian  
77 households after a decade, the reason should be sought in welfare policies in the population  
78 structure. Previous studies showed that the per capita demand for food decreases with an increase  
79 in household size regardless of whether the countries are rich or poor (Deaton & Paxson, 1998;  
80 Gibson & Kim, 2007). Moreover, a study conducted in the US revealed that a household of two  
81 adults consumes 31-35% less than two households with one adult each at a fixed income level  
82 (Lazear & Michael, 1981). Therefore, sharing opportunities can result in saving some services such  
83 as food preparation and also in buying a part of food for such households. Accordingly, the  
84 economies of scale in consumption emphasize that the household's consumption expenditure  
85 changes by adding a family member, leading to the reduction of the per capita expenditure for each  
86 member compared to the previous status as regarded in the concept of economies of scale in  
87 consumption. Thus, economies of scale provide the standard level of life of each family member  
88 (Kakwani, 1977).

## 89 90 **Literature review**

91 The concept of economic scale exists more in the discussion of production scale (Hoang et al.,  
92 2021; Houedjofonon et al., 2020; Jetté-Nantel et al., 2020), but it is considered less in consumption.  
93 The economies of scale in consumption have been developed on Engel's and Barten's models.

94 According to Engel law, the more affluent the households, the lower their proportion of food share  
95 would be (Dudek, 2014a; Soon, 2022). Engel's method has been dominantly applied in household  
96 size economies estimation due to its simplicity, using food share as a welfare indicator of different-  
97 sized households (Deaton & Muellbauer, 1980; Lanjouw & Ravallion, 1995). (Deaton, 1997)  
98 indicated that the Engel method works but makes no sense. (Deaton & Paxson, 1998) draw from  
99 Barten's model in their attempt to estimate the household scale. (Gan & Vernon, 2003) and  
100 (Gibson, 2002) estimated the household economies scale.

101 Economies of scale in household consumption generally occur as a result of joint consumption of  
102 public goods. In order to analyze this phenomenon expenditure shares on housing, which  
103 can be treated as a representative of the public good, and expenditure shares on food  
104 - representing private goods - are examined (Dudek, 2014b; Perali, 2003). Thus, determining the  
105 economies of scale in households according to the characteristics and conditions prevailing in each  
106 household is of great significance in developing the fare and population growth strategies. Few  
107 studies consider the economic scale of the household, while this article is in using this concept to  
108 evaluate the government's policy. Therefore, the contribution of this article is to evaluate the  
109 efficiency of population growth policies by measuring the role of the scale of food and housing  
110 expenditure.

111 Household size is a pivotal demographic feature shaping individual economic decisions (Curtis et  
112 al., 2017). Extensive studies have revealed within-household economies of scale (also referred to  
113 as household scale economies) for multiple commodities (Ellsworth-Krebs, 2020; Nelson, 1988;  
114 O'Neill & Chen, 2002).

115 Among them, electricity has larger scale effects since it is more sharable than other goods  
116 (Underwood & Zahran, 2015), such as food or clothing. Reducing scale effects due to smaller  
117 households could have negative impacts on ecological /environmental sustainability, such as  
118 increased CO2 emission (Ala-Mantila et al., 2016; Fremstad et al., 2018; Underwood & Fremstad,  
119 2018; Underwood & Zahran, 2015) and resource consumption (Huang, 2015; Longhi, 2015; O'Neill  
120 & Chen, 2002), as well as on biodiversity (Bradbury et al., 2014; Yu & Liu, 2007).

121 Researchers and policymakers believe that the growth of an economy correlates with the  
122 consumption pattern of households as consumption patterns make welfare analysis easier (Akram,  
123 2020; Ullah, 2018). The consumption patterns of households are also useful in business progress  
124 as the whole investment setup relies on the consumption patterns of a country (Akram, 2020).

125 After reviewing the above literature, we found that many researchers concluded that changes in  
126 income and price of a product and its substitutes have a significant influence on product demand.  
127 The Possible justification behind this notion is that when a change occurs in the price of a product,  
128 consumers tend to reduce the quantity demanded (QD) as per the law of demand (Al Rawashdeh,  
129 2022).

130 The present study is organized as follows first, the expenditures and income of Iranian households  
131 are presented during 2011-2021. Then, the economies of scale for two time periods are conducted  
132 for the food and housing group by estimating the expenditure share relationships for the group of  
133 foods, housing and other goods. Finally, the results and the role of changes in household size and  
134 per capita expenditure on food and housing are investigated and the corresponding policies are  
135 proposed. The question of how household adjusts their consumption patterns in response to changes  
136 in size encourages several researchers to conduct studies in different contexts to observe the  
137 behavioral pattern of consumers.

## 138 **MATERIALS AND METHODS**

139 The conceptual model of the study is as Fig 1.

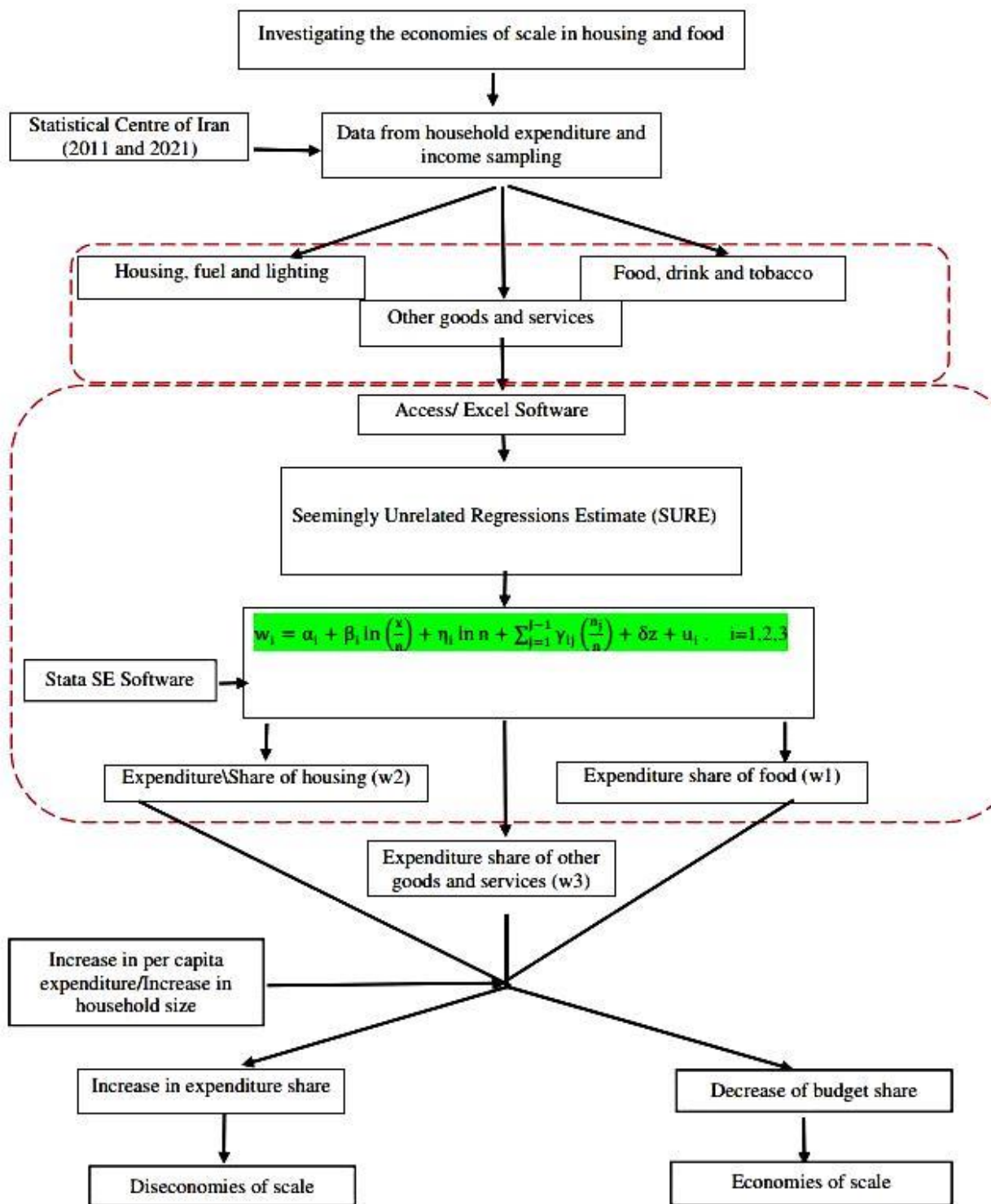


Fig. 1. Conceptual model of the study.

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144 **Seemingly Unrelated Regressions Estimate (SURE)**

145 To determine the economies of scale in the consumption of goods and services the scale function  
146 is defined as equation (1) (Mok et al., 2010; Mok et al., 2011):

147 
$$\phi(n) = n^{1-\sigma} \tag{1}$$

148 where  $n$  represents the number of household members and  $\sigma$  indicates the elasticity of the scale  
149 that is calculated as equation (2) (Mok et al., 2010; Mok et al., 2011):

150 
$$\sigma = 1 - \frac{\partial \ln \phi(n)}{\partial \ln n} \tag{2}$$

151 If the scale elasticity is zero, the scale function equals the number of household members. In other  
152 words, there are no economies of scale in the consumption of goods in the household. In addition,  
153 any increase in the household size is compensated by an increase equivalent to the per capita  
154 consumption of the good. In this regard, the consumption of the household members remains at the  
155 same level as before. Accordingly, the goods used in the household are purely private and cannot  
156 be shared. If the elasticity of scale equals one, the scale function becomes equal to one and there  
157 will be economies of scale in consumption at the household level. Therefore, the consumption is  
158 compensated by less than a 1% increase in the consumption of goods with a 1% increase in the  
159 household size so that the consumption of the household members remains at the same level as  
160 before. Such a good is pure public and can be used by all members without adverse effects.

161 The effect of household size on changes in per capita food consumption with a certain income level  
162 was tested by dividing the sample into quartiles and examining the coefficient of  $\ln n$ . To check  
163 the economies resulting from the scale of households, the equation (3) was used (Deaton &  
164 Muellbauer, 1980; Mok et al., 2010; Mok et al., 2011):

165 **LA/AIDS Model**

166 The general form of the Almost Ideal Demand System (AIDS) with linear approximation (LA) is  
167 given by (Govindaraj et al., 2012):

168 
$$\omega_i = \alpha_i + \sum_j \gamma_{ij} \ln p_j + \beta_i \ln \left( \frac{X}{P} \right) + v_i$$

169 Where,  $w_i$ = expenditure share of the  $i^{\text{th}}$  commodity

170  $p_j$ = Price of the  $j^{\text{th}}$  commodity

171  $X$ = is the total expenditure

172  $v_i$ = error term

173  $P$ = is the price level

174 The theoretical demand restrictions in terms of adding up, homogeneity in prices and income, and  
 175 the symmetry of cross effects of demand functions are given below

176 Adding up  $\sum_{i=1}^n \alpha_i = 1$   $\sum_{i=1}^n \gamma_{ij} = 0$

177 Homogeneity  $\sum_j \gamma_{ij} = 0$

178 Symmetry  $\gamma_{ij} = \gamma_{ji}$

179

180 **Calculation of Elasticities using LA/AIDS model**

181 The uncompensated price elasticity of commodity i with respect to commodity j is given by

182 
$$e_{ij} = \frac{\gamma_{ij}}{\bar{\omega}_i} - \frac{\beta_i \bar{\omega}_j}{\bar{\omega}_i} - \delta_{ij}$$

183 Where  $\delta_{ij} = 1$  if  $i = j$  and  $\delta_{ij} = 0$  if,  $i \neq j$ .

184 The expenditure elasticity will be estimated by

185 
$$e_i = 1 + \frac{\beta_i}{\bar{\omega}_i}$$

186 Using slutsky model, the compensated price elasticities “ $e_{ij}$ ”, can be computed from,

187 
$$e_{ij}^* = e_{ij} + w_j e_i$$

188 In the following, in order to examine the degree of economies of scale of households from the  
 189 system of equations it was used below (Deaton & Muellbauer, 1980).

$$\begin{aligned} w_1 &= \alpha_1 + \beta_1 \ln \left( \frac{x}{n} \right) + \eta_1 \ln n + \sum_{j=1}^{J-1} \gamma_{1j} \left( \frac{n_j}{n} \right) + \delta z + u_1 \\ w_2 &= \alpha_2 + \beta_2 \ln \left( \frac{x}{n} \right) + \eta_2 \ln n + \sum_{j=1}^{J-1} \gamma_{2j} \left( \frac{n_j}{n} \right) + \delta z + u_2 \\ w_3 &= \alpha_3 + \beta_3 \ln \left( \frac{x}{n} \right) + \eta_3 \ln n + \sum_{j=1}^{J-1} \gamma_{3j} \left( \frac{n_j}{n} \right) + \delta z + u_3 \end{aligned} \quad (3)$$

190 where  $w_1$ ,  $w_2$ , and  $w_3$  show the share of food, housing and other goods and services from the total  
 191 household expenditure,  $x$  indicates the total expenditure of the above-mentioned product groups,  
 192 and  $n$  represents the household size. In addition,  $\frac{x}{n}$  shows the per capita expenditure of household  
 193 members,  $\ln n$  is considered as the effect of the economies of scale, and  $\frac{n_j}{n}$  indicates the relative  
 194 composition of the household members in terms of the age of the household members. Since the  
 195 total share of the households' consumption basket for goods is equal to one, the elimination of each  
 196 of the equations can be arbitrary. Among the equations of the system, the equation related to the  
 197 group or subgroup that is less significant than other groups is eliminated (Gundimeda & Köhlin,



198 2008). In this research, because the focus is on food and housing, other goods and services were  
199 removed from the equation. Therefore, there are no results of the third equation in the tables  
200 (SURE<sup>1</sup> method).

201

## 202 **Data and Information**

203 The cost and income survey data published annually by the Statistical Centre of Iran is one of the  
204 most significant and widely used sources of information for household studies in Iran and its 2011-  
205 2021 issue is applied in this study. Moreover, Access, Excel, SPSS and Stata SE software were  
206 used for data analysis.

207

## 208 **RESULTS AND DISCUSSION**

### 209 **Socio-economic characteristics of the studied sample**

210 As shown in Table 1, the average household size has decreased after a decade and Iran faces a  
211 relatively older population. The average household size was 4 In 2011 and it decreased to 3 in  
212 2021. Thus, the policies for encouraging population growth have not been highly effective. The  
213 significant point of comparing two periods of time separated by a decade is that the share of food  
214 and housing in 2021 has shown a significant increase compared to 2011. Share of food and housing  
215 in the household expenditure was 47.96 and 24.25, respectively which has been increased to and  
216 56.76 and 32.12 to 2021. During the last decade, Macroeconomic shocks, climate change, global  
217 supply shocks, and sudden political changes, are all from among the factors that can affect the price  
218 of food. In other words, prices. They depend on different sources and governments are looking for  
219 policy options to reduce price fluctuations (Amolegbe et al., 2021).

220 According to the data of the Iranian Statistics Center from the urban areas of the country, the share  
221 of housing in household expenses has increased during the last decade.

222 Things like the shock of sanctions, inflammation in the field of foreign exchange, increase in  
223 inflation and the influx of capital demands to the housing sector, this sector also faced a sharp jump  
224 in prices and as a result, the purchasing power of households lagged behind the price of housing.  
225 Therefore, the share of housing in the total household expenditures (food and non-food) increased.

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<sup>1</sup>. Seemingly Unrelated Regressions Estimate

**Table 1.** Socio-economic characteristics of the studied sample for 2011 and 2021.

Item	2011		2021	
	Mean	SD	Mean	SD
Number of households	19739	---	20136	---
Household size (person)	4	1.85	3	3.76
Share of men in household headship (percentage)	86.86	---	75.52	---
Age of head of household (year)	51.13	16.11	57.34	18.98
Share of new-born babies-4 years old male members in the household (percentage)	3.01	8.37	2.02	4.12
Share of 5- 10 year old male members in the household (percentage)	4.36	9.82	3.32	6.22
Share of 11-15 year old male members in the household (percentage)	3.82	9.07	2.61	7.55
Share of 16-60 year old male members in the household (percentage)	28.66	20.99	34.73	32.76
Share of male members over 60 years old in the household (percentage)	8	17.60	12.05	9.50
Share of female new-born babies up to four years old in the household (percentage)	3.05	8.37	2.04	2.34
Share of 5- 10-year-old female members in the household (percentage)	4.20	9.70	3.28	4.10
Share of 11 -15 year old female members in the household (percentage)	3.44	8.58	2.41	5.16
Share of 16-60 year old female members in the household (percentage)	31.51	20.16	41.67	43.67
Share of female members over 60 years old in the household (percentage)	9.90	23.74	11.13	10.15
Share of illiteracy in the heads of households (percentage)	41.99	0.49	34.45	53.82
Share of employment in the heads of households (percentage)	73.27	0.44	61.22	55.38
Share of marital status in the heads of households (percentage)	85.64	0.35	71.43	63.42
Share of household food expenditure (percentage)	47.96	13.43	56.76	31.16
Share of household housing expenditure (percentage)	24.25	12.97	32.12	21.13
Share of household other goods and service expenditure (percentage)	27.79	13.71	11.12	18.76

230 Source: research findings.

231

### 232 **The economies of scale of goods and services in households' consumption basket**

233 Tables 2 and 3 indicate the economies of scale for goods and services (food and housing) of the  
 234 sample households studied in 2011 and 2021, respectively. As shown, per capita expenditure and  
 235 household size have negative effects on the expenditure share of food and housing among the  
 236 significant variables in the system equations for food in 2011. In this regard, the per capita share  
 237 of food and housing decreases with the increase in per capita expenditure or the size of the  
 238 household. The household food expenditure share was reduced by 0.053 as a result of a 1% increase  
 239 in the per capita expenditure. In addition, the household housing expenditure share decreases by

240 approximately 0.34 and 0.33 with a 1% increase in the per capita expenditure and the household  
241 size (Table 2). This phenomenon is considered one of the aspects of economies in the household  
242 in 2011. Increasing the per capita expenditure of households and reducing the share of food or  
243 housing in the total household expenditure can increase the context for more use of goods and  
244 services in the household. So, welfare improvement is considered as more use of goods and  
245 services. Therefore, it can lead to an increase in the well-being of the whole household. However,  
246 the per capita expenditure and household size indicate a positive effect on the share of food and  
247 housing in the household expenditure in 2021. The share of the food household expenditure  
248 increases by 0.45 and 0.010 with a 1% increase in per capita expenditure and household size (Table  
249 2). Further, the share of the housing household expenditure increases by 0.30 and 0.28 concerning  
250 a 1% increase in per capita expenditure and household size (Table 3). In other words, the share of  
251 the household expenditure in food and housing increases with an increase in per capita expenditure  
252 or household size, indicating the absence of economies of scale in this year.

253 The first rule is the parasite law itself, which states that the share of food in the budget decreases  
254 with an increase in income or total expenses. The second rule is that with constant resources, the  
255 share of food increases with the increase in household size.

256 (Deaton & Paxson, 1998) tested (Barten, 1964) model and surprisingly found the exact opposite  
257 pattern where food consumption decreases as the household grows. The results of the present  
258 research confirm this fact. The issue of economies of scale is more evident in the case of housing  
259 (public good) than food. The results of the present research show that over time, the economy of  
260 scale in food decreases compared to housing. This is also true for per capita consumption  
261 expenditure. Similarly, using the US Consumer Expenditure Survey, (Nelson, 1988) found large  
262 economies of scale in shelter and small economies of scale in furniture, maintenance, food, and  
263 transportation. Similarly, using the US Consumer Expenditure Survey, (Nelson, 1988) found large  
264 economies of scale in shelter and small economies of scale in furniture, maintenance, food, and  
265 transportation.

266 Researchers used cross-sectional household income data from ten developed countries, and on the  
267 other hand, other scientists (Cutler & Katz, 1992) using household expenditure data in England to  
268 the sensitivity of poverty and inequality in They found the estimation of economy of scale in  
269 consumption and the use of equivalent scales in the comparison of welfare.

270 It can be said that in the studied sample households, there is an economy of scale in food  
 271 consumption, but this phenomenon is greater in the use of housing because housing is more  
 272 common than food.

273 The correctness of the Engel law states that among households with the same population  
 274 composition, those with a higher share of food generally have less income, so with other conditions  
 275 being constant, they have a lower level of well-being. But this is nothing more than the retelling of  
 276 the parasite law itself because the presence of other minors increases the share of household food.  
 277 The addition of children indeed moves the budget in the same direction as the decrease in income,  
 278 but this is very different from arguing that increasing income to the extent that it keeps the share  
 279 of food constant is the exact amount needed for Compensation for additional expenditures incurred  
 280 by Children. All members of the household do not have the same allocation and logically, the  
 281 elderly consume specific and fewer goods. This issue can affect the economy of scale due to less  
 282 consumption.

283  
 284 **Table 2.** Estimation results of the model for determining the economies of scale in the Food  
 285 household consumption.

Food model	2011			2021		
	Coefficient	SD	Elasticity	Coefficient	SD	Elasticity
The logarithm of household expenditure per capita	<b>-0.0253***</b>	<b>0.0016</b>	<b>-0.0529<sup>(1)***</sup></b>	<b>0.0223***</b>	<b>0.0062</b>	<b>0.4552<sup>(1)***</sup></b>
The logarithm of household size	<b>-0.0288***</b>	<b>0.0031</b>	<b>-0.0604<sup>(1)***</sup></b>	<b>0.0052</b>	<b>0.0071</b>	<b>0.0106<sup>(1)***</sup></b>
The proportion of male members less than 4 years old	-0.0058	0.0155	-0.0003	-0.0179	0.0376	-0.0009
The proportion of male members aged 5 - 10 years old	-0.0115	0.0132	-0.0007	0.0093	0.0299	0.0007
Proportion of male members aged 11 - 15 years old	0.0243*	0.0144	0.0014*	0.0547*	0.0329	0.0038*
The proportion of male members aged 16-60 years old	-0.0044	0.0046	-0.0032	-0.0059	0.0134	-0.0046
The proportion of female members less than 4 years old	0.0076	0.0152	-0.0004	0.0171	0.0359	0.0008
The proportion of female members aged 5 - 10 years old	0.0138	0.0134	0.0009	0.0039	0.0309	0.0003
Proportion of female members aged 11 - 15 years old	-0.0026	0.0153	-0.0002	0.0132	0.0325	0.0009

The proportion of female members aged 16-60 years old	-0.0006	0.0052	-0.0004	0.0276	0.0167	0.0184*
Gender of the head of the household	-0.0034	0.0047	-0.0062	0.0018	0.0078	0.0026
Age of the head of the household	0.0003***	0.0007	0.0317***	-0.0003	0.0002	-0.0281
Literacy status of the head of the household	-0.0382***	0.0024	-0.0478***	-0.0469**	0.0062	-0.0362***
Employment status of the head of the household	0.0345***	0.0027	0.0487***	0.0191***	0.0058	0.0194***
Marital status of the head of the household	0.0281***	0.0045	-0.0007	0.0292***	0.0077	0.0382***
y-intercept	0.8332***	0.0247	---	0.1783**	0.0835	---
Number of observations	19739	---	---	20136	---	---
Chi <sup>2</sup> statistics	813.1100***	---	---	144.3200***	---	---
Breusch-Pagan test	4567.6224	---	---	2603.8750	---	---

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287  
288  
289  
290

Source: Research findings

Note: \*, \*\* and \*\*\* indicate levels of significance at 10%, 5% and 1%, respectively.

**Table 3.** Estimation results of the model for determining the economies of scale in the Housing of the household consumption.

Housing model	2011			2021		
	Coefficient	SD	Elasticity	Coefficient	SD	Elasticity
The logarithm of household expenditure per capita	<b>-0.0772***</b>	<b>0.0015</b>	<b>-0.3352<sup>(1)</sup>***</b>	<b>-0.0914***</b>	<b>0.0058</b>	<b>-0.3075<sup>(1)</sup>***</b>
The logarithm of household size	<b>-0.0753***</b>	<b>0.0029</b>	<b>-0.3271<sup>(1)</sup>***</b>	<b>-0.0835***</b>	<b>0.0067</b>	<b>-0.2811<sup>(1)</sup>***</b>
The proportion of male members less than 4 years old	-0.0026	0.0139	0.0003	-0.0387	0.0359	-0.0033
The proportion of male members aged 5 - 10 years old	0.0158	0.0118	0.0022	0.0051	0.0286	0.0007
Proportion of male members aged 11 - 15 years old	-0.0146	0.0130	-0.0018	-0.0504	0.0314	-0.0061
The proportion of male members aged 16-60 years old	-0.0030	0.0042	-0.0044	-0.0229*	0.0128	-0.0295*
The proportion of female members less than 4 years old	0.0151	0.0137	0.0014	-0.0101	0.0344	-0.0008
The proportion of female members aged 5 - 10 years old	-0.0104	0.0120	-0.0014	-0.0481	0.0296	-0.0062
Proportion of female members aged 11 - 15 years old	-0.0016	0.0137	-0.0002	-0.0233	0.0311	-0.0029
The proportion of female members aged 16-60 years old	0.0019	0.0046	0.0026	-0.0353**	0.0161	-0.0393**

Gender of the head of the household	0.0047	0.0043	0.0182	-0.0027	0.0075	-0.0066
Age of the head of the household	0.0005***	0.0001	0.1086	0.0009***	0.0002	0.1853***
Literacy status of the head of the household	0.0309***	0.0022	0.0784***	0.0343***	0.0059	0.0458***
Employment status of the head of the household	-0.0232***	0.0024	-0.0779***	-0.0146***	0.0056	-0.0277**
Marital status of the head of the household	-0.0179***	0.0041	-0.0685***	-0.0209***	0.0074	-0.0497***
y-intercept	1.4116***	0.0224	---	1.608***	0.0815	---
Number of observations	19739	---	---	3866	---	---
Chi <sup>2</sup> statistics	4010.0100***	---	---	789.0400***	---	---
Breusch-Pagan test	5783.7270	---	---	1703.9880	---	---

291 Source: Research findings.

292 Note: \*, \*\* and \*\*\* indicate levels of significance at 10%, 5% and 1%, respectively.

293  
294 In evaluating the elasticity in the two groups of food and housing model, the increase in the  
295 household size has a much more highlighted role in the share of housing than the share of household  
296 food expenditure regardless of the type and direction of influence. Thus, the same change in the  
297 household dimension has an almost five times higher effect on the share of housing compared to  
298 the share of food (0.32 vs. 0.06 for 2011 and 0.28 vs. 0.01 for 2021). The increase in the household  
299 size through the economies of high scale in housing can overshadow the economies of smaller scale  
300 in food and the increase of household size results in the economies of scale.

301 The age and gender of household members are other significant issues causing the economies of  
302 scale at the household level. Increasing the percentage of 11-15-year-old children causes the  
303 economies of scale and the increase of other age groups to households had no effect and was not  
304 significant in creating the economies of scale in food consumption. This is adverse in the case of  
305 housing. Therefore, different age combinations in both gender groups of household members had  
306 no significant effect on the share of the household housing expenditure. The age group of 16- 60  
307 years, male and female, had a significant effect on the share of household housing expenditure in  
308 2021.

309 The other significant issues in the field of economic efficiency at the household level include the  
310 socio-economic characteristics of the head of the household such as their gender, age, literacy  
311 status, and employment status. In the field of food, increasing the literacy level of the head is a  
312 factor in creating economies in the consumption of goods. However, the increasing age and  
313 employment of the head can negatively affect this issue. In the field of housing, increasing the age

314 and literacy level of the head impedes economies at the household level and being employed and  
315 married results in economies at the household level.

316 The results indicated that the socio-economic characteristics of household heads, age, and gender  
317 of household members have various effects on the occurrence or non-occurrence of economies at  
318 the household level. Due to the heterogeneity of the effects related to this category for household  
319 characteristics, it is impossible to focus only on the characteristics of household heads, as well as  
320 the age and gender of household members' inappropriate policies to increase the welfare of  
321 households. In this regard, welfare economy policymakers should focus on the centrality of the  
322 household size and per capita expenditures of household members.

## 323 324 **CONCLUSIONS**

325 In general, the change in per capita expenditure not only failed to reduce the expenditure share of  
326 food items in the household after a decade in 2021, but also the household housing expenditure  
327 failed to experience a noticeable decrease. The reason for such an event is attributed to the increased  
328 price of basic food items in the global and Iranian markets. On the other hand, housing has become  
329 a luxury commodity due to runaway inflation in Iran in the last decade and most people in different  
330 income deciles cannot buy a house. In other words, such developments indicate that the economic  
331 savings caused by per capita spending on food and housing have not occurred and the household's  
332 welfare has faced problems in using other goods and services assuming the household size is  
333 constant. Each household should deal with the exorbitant cost of food staples and housing  
334 compared to the past. In the case of food staples and the variable effect of household size, the  
335 diseconomies caused by the household size have intensified after a decade (comparing 2011 to  
336 2021). The household food expenditure staples are assumed to be constant with an increase in the  
337 number of household members by assuming constant per capita of expenditures more than a two-  
338 fold increase. The reason for this issue is attributed to international sanctions, trade restrictions due  
339 to the coronavirus and other factors, high inflation, and wage laws in Iran. Although housing is  
340 considered more public goods than food, the increased household size and the subsequent increase  
341 in income due to the active and working population in the household could not cope with the jump  
342 in housing prices. As a result, the share of the housing expenditure has decreased in the household  
343 much less than a decade ago. Due to the role of household size in the household expenditure share  
344 in 2021, the policies that follow population growth cannot be successful regardless of the role of  
345 the household size in the expenditure share of the household consumption basket.

346 The results of the study in the field of food are consistent with Engel's law. In addition, the results  
347 are in line with the view of (Deaton & Paxson, 1998) in the case of housing. Based on Engel's law,  
348 the share of food increases with an increase in the size of the household. However, Engel's law is  
349 not applicable in the case of housing according to (Deaton & Paxson, 1998). The share of housing  
350 in the household expenditure not only does not increase significantly but sometimes even decreases  
351 with an increase in the household size. Thus, there are no economies of scale in food consumption,  
352 but this phenomenon can be observed in the case of housing. The results of this study are consistent  
353 with the findings of (Kakwani et al., 2005; Logan, 2011; Nelson, 1988), indicating that the  
354 economies of scale in different household consumption goods are different from each other and  
355 depend on the characteristics of those goods. More general goods such as housing have provided  
356 economies of scale for households compared to food. Nevertheless, there is no such advantage in  
357 food consumption. In the food preparation process where one food item is prepared for several  
358 people at the same time, the economies of scale are an expected phenomenon (Gibson & Kim,  
359 2007; Kakwani, 1977). However, this phenomenon was not observed in practice based on the  
360 results of the study. Perhaps, the reason for such a case in Iran is the role of women in the food  
361 preparation process. Meanwhile, the results indicated that women have no role in the changes  
362 related to the share of food. Due to the privacy of food staples, what is common in Iran is the  
363 diseconomies of scale in the food group. If the government looks for welfare improvement policies  
364 with the maximum effectiveness rate at the household level as a result of increasing the household  
365 size from the welfare perspective, providing housing or assistance for households with a larger  
366 population has priority due to the economies of scale. The diseconomies of scale in the current  
367 conditions of Iran have also caused the aging of the population. From a demographic perspective,  
368 the aging of the population will reduce fertility and the power of regeneration. From an economic  
369 perspective, human power is one of the basic factors in economic growth, especially in the  
370 knowledge-based economy. In addition, the country's economic workforce decreases with the  
371 aging of the population. Although the current economy is more dependent on oil, the role of  
372 manpower in economic growth becomes more significant with the end of oil reserves. The failure  
373 of policies to encourage population growth is of great importance. Among these policies, subsidies  
374 can be granted to each child, facilities with low interest rates can be dedicated to the number of  
375 more children, and cars can be allocated in the lottery to mothers with two or more children.  
376 However, reforming income policies and supporting population deciles through insurance can



377 produce much better results in improving Iran's population structure. The concern about the state  
378 of food security and the access of people in the community to shelter during recent years is proof  
379 of this claim.

380 Thus, it is suggested that the policies of population increase in each country should be adjusted  
381 based on the reactions of the households to the changes made in their expenditure share at each  
382 period so that the effectiveness of the policies can be anticipated.

383

#### 384 **Limitations and future research directions**

385 Due to the problem of access to data and information, it was not possible to investigate in  
386 different geographical regions of the country.

387 Since health and food security are among the strategic goals of the country's 20-year vision  
388 document, to examine the health effects of the results and change the appropriate policy, it is  
389 suggested that the present research be carried out separately and by the city of the province. In  
390 addition, I can compare an issue in urban and rural areas. In addition, conducting research in  
391 different income deciles can be used as a suitable indicator for changing household food support  
392 policies.

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