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Demand Estimates for Agricultural, Manufacturing and Service Products[1] [2]

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Abstract

In this paper, based on the annual household budget survey and by using the input–output table, the main characteristics of the demand side of the domestic product market are analyzed. This has been exercised for different income groups. We have then, estimated the price and income elasticities for different product groups with the use of an Almost Ideal Demand System model.

Keywords: Household Expenditure, Manufacturing Products, Income Elasticity, Price Elasticity.

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1. Introduction

Import substitution has been the dominant strategy in the industrial sector of Iran for some decades. The low value of manufacturing export in comparison with the total value added of the manufacturing sector indicates that, domestic demand has been the main driving force, for the stimulation of growth for this sector. Any view about the future of Iran industrial sector without enough knowledge about this important part of the market will be unsuccessful.

The purpose of this study is to introduce the main characteristics of the demand side of the domestic product market, comprising agricultural, manufacturing and service sector. In this paper, we will try to answer to the question that, "To what extent, demestic demand can induce industrial growth?" or: which composition of different industrial activities can grow steadily on the basis of domestic demand and which can grow only by relying on international markets?

In the current paper, the household expenditure on durable and non-durable manufacturing goods for the rural and urban population and for different income groups has been analyzed. The results of the study indicate that, domestic demand is not strong enough to provide a long–term manufacturing growth. In the next section, the model, consisting of an Almost Ideal Demand System (AIDS) is introduced and in the third section, the methodology of data processing is discussed. Section 4 is devoted to the analysis of household budget and section 5, provides the estimates of the income and price elasticities. The final section makes a conclusion.

2. The Model

Stone (1954), for the first time, with the use of a linear system equations, estimated the household demand for different product groups for UK. For Iran, Tabibian (1984) has used the same model, for the estimation of price and income elasticities of demand for the major product groups.

The realized shortcomings of the linear equations demand system, led to the use of non-linear equations. AIDS is one of these non-linear models, which was first used by Deaton and Muellbauer (1980, 1981). This kind of model is consistent with the household's optimizing behavior. The main characteristics of the AIDS models are as follows:

1. The system is extracted from a utility maximization problem with taking the budget constraint into account.

2. The system allows a non-linear Engle curve.
3. The model is capable of including the impacts of the changes in population and demand.
4. Because of the flexibility of the model, the estimates of elasticities are more accurate.

Equation (1) introduces a PIGLOG cost function in which u can change between zero and one.

$$Log\ c(u,p)=(1-u)\ log\ \{a,p\}+u\ log\ \{b(p)\} \quad (1)$$

In this equation, u=0 is associated with the minimum utility and u=1 is consistent with the maximum.

In order to have enough flexibility, the following forms for a(p) and b(p) are assumed:

$$\log a(p) = a_0 + \sum\nolimits_k \alpha_k \log P_k + 1/2 \sum_k \sum_j \gamma_{ij}^* \log p_k \log p_j$$

$$\log b(p) = \log a(p) + \beta_0 \Pi P_x^{\beta x}$$

Substituting for a(p) and b(p) in equation (1) results the AIDS cost function:

$$\log c(u,p) = \alpha_0 + \sum_k \alpha_k \log P_k + 1/2 \sum_k \sum_j \overset{*}{\gamma}_{kj} \log P_k \log p_j + u\beta_0 \prod_k p_k^{\beta k} \quad (2)$$

$$\sum_k \gamma_{kj}^* = \sum_j \gamma_{kj}^* = 0 \qquad \sum \beta_j = 0, \sum_i \alpha_i = 1$$

It can be easily concluded that c(u,p) is linear in the vector of p. By taking derivatives from the cost function with respect to the relative prices, the compensated demand equation can be obtained:

$$w_i = \frac{P_i h_i}{c(u,p)} = \frac{\partial \log c(u,p)}{\partial \log P_i} \quad (3)$$

$$w_i = \alpha_i + \sum_j \gamma_{ij} + \beta_i u \beta_o \prod p_k^{\beta k} \quad (4)$$

where:

$$\gamma_{ij} = 1/2(\gamma_{ij}^* + \gamma_{jk}^*)$$

Now from equations (2) and (3), we can obtain AIDS:

$$w_i = \alpha_i + \sum \gamma_{ij} \log\ p_j + \beta_i \log\{\frac{x}{p}\} \quad (5)$$

in which p as the price index has the following form:

$$\log p = \alpha_0 + \sum_k \alpha_k \log p_k + 1/2 \sum_j \sum_j \gamma_{kj} \log p_k \log p_j$$

Therefore, the model in general form will be: (6)

$$w_i = \alpha_i - \beta_i \alpha_o + \sum \gamma_{ij} \log P_j + \beta_i \left\{ \log x - \sum_k \alpha_k \log P_k - \frac{1}{2} \sum_k \sum_y \gamma_{kj} \log P_k \log P_j \right\}$$

We have to impose the following constraints in order to meet theoretical requirements:

1. Asymmetry $\gamma_{ij} = \gamma_{ji}$
2. Homogeneity $\sum_{j=1}^{n} \gamma_{ij} = 0$
3. Additivity $\sum_{i=1}^{n} \alpha_i = 1, \sum_{i=1}^{n} \gamma_{ij} = 0, \sum_{i=1}^{n} \beta_i = 0$

Now we can obtain equations for the income and price elasticities accordingly:

$$e_i = 1 + \frac{\beta_i}{w_i}$$

$$e_{ii} = \frac{1}{w_i} \left[\gamma_{ii} - \beta_i w_i + \beta_i^2 \log(\frac{x}{p}) \right] - 1$$

$$e_{ij} = \frac{1}{w_i} \left[\gamma_{ij} - \beta_i w_j + \beta_i \beta_j \log(\frac{x}{p}) \right]$$

In this study, we construct our work on the basis of equation (5) and its subsequent implications for the price and income elasticities.

3. Data Processing

In order to estimate the demand system, we need to work on the household budget data and also we need to construct relative price indices.

3.1. The Household Expenditure

In this research, in order to estimate demand equations for manufacturing products, as the first step, we need to find a mapping between household consumption and manufacturing products. In the household budget survey, data for the expenditure of 540 commodities is collected. We obtain expenditure for each commodity first and then with the use of input-output table, we find its counterpart in the 4 digit ISIC[1] codes. Therefore, the household expenditure for each ISIC digit code is obtained. This has been done for the period of 1990-1999 on a yearly basis.

In this work we have processed millions of records. This volume of data comes from the number of commodities, number for households and the number of years. Methodologically, for each sample of urban and rural household we have divided the population into 500 groups. For example for the year 1999, the urban sample size has been consisting of 12500 households and hence on average, for each group we had 25 households. This indicates that in our model, each unit of data has been obtained by averaging out the information of 25 households. This form of averaging data would lower the errors of calculation. For making these groups, we have calculated expenditure for each urban and rural household and they have been sorted from the lowest to the highest values. After that, the resultant data has been divided into 500 groups. For example, the first 25 households which are the lowest income group will form the first group. As a result of this procedure, we have created 1000 groups for each year (500 urban and 500 rural). This in fact, provides a Psuedo panel data for ten years. Hsiao (1986) has done a number of studies on the basis of Psuedo panel data[2].

1. International Standard Industrial Classification.
2. Because of lack of confidence on the existing data of households' income, we have used data on the households' expenditure. This obviously, underestimates the upper income groups.

3-2. Price Indices

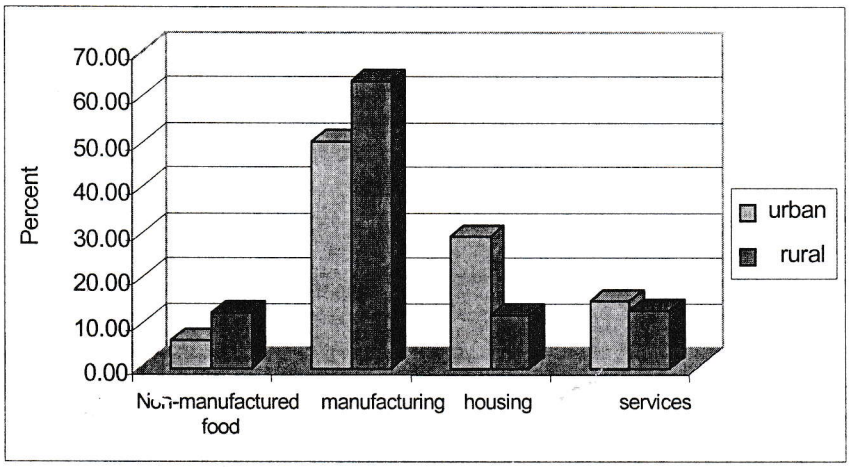
For the estimation of demand systems, we need price indices for each product group. For this purpose, we had to create these indices by analyzing the details of consumer price index (CPI) which is published by the Central Bank. As the first step, we have divided the items of the household expenditure, into the four digit ISIC groups and then we have calculated the weight which each of these items has in each of the four digit ISIC group. We have used these weights for the calculation of price indices. For example, if for one of the ISIC groups we have commodities with the prices of p_1 to p_n and the weights of w_1 to w_n, the price index for that group will be:

$$P_i = p_1 w_1 + p_2 w_2 + \ldots + p_n w_n \qquad \sum_{j=1}^{n} w_j = 1$$

4.The Analysis of Household Expenditure

In this section, we provide the analysis of the household expenditure for different income groups. For the analysis to be more informative, we divide data of ISIC groups into four groups of non-manufactured foods, manufactured products, housing and services. Figure 1, provides the results for the urban and rural households.

Figure- 1. The share of the expenditure on each product group



As can be seen from Figure 1, 50 percent of the households' urban expenditure and 63 percent of the rural households' expenditure is spent on

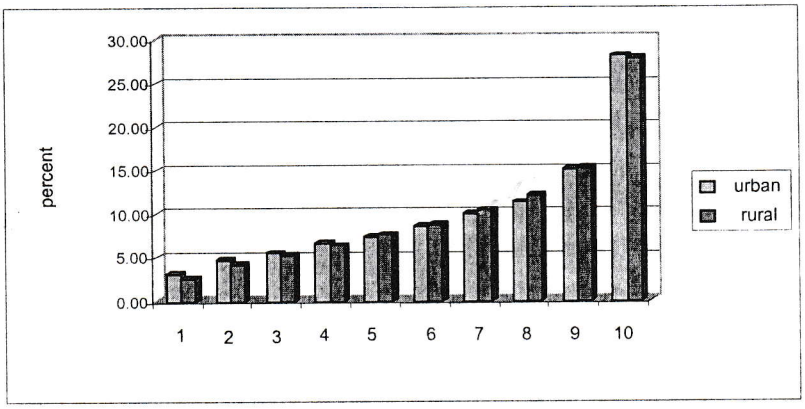
manufactured products. According to this figure, for different income groups, increases change from 47 percent (for the poorest) to 54 percent (for the richest). These are provided in Table 1.

Table-1. The share of the expenditure of each income group on manufacturing products

Tenfolds	urban	rural
1	46.98	58.29
2	47.49	59.53
3	47.35	59.45
4	48.44	60.60
5	47.91	60.90
6	48.10	61.83
7	48.78	62.22
8	49.64	62.41
9	50.27	64.05
10	53.80	67.33

Now, it is useful to know, how household expenditure on manufactured products is divided into different income groups. This is presented by Figure2.

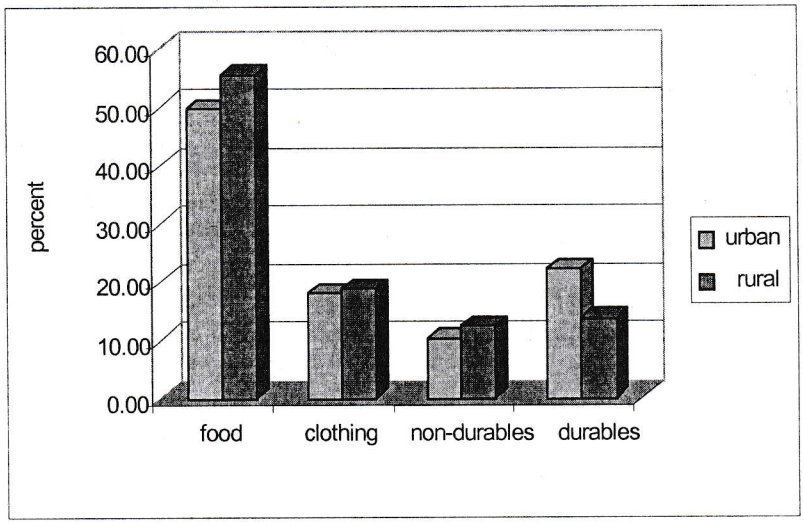
Figure- 2. The share of each income group in the spending on manufacturing products



As can be seen from the figure, about 43 percent of the household expenditure on manufacturing products, comes from the two richest tenfold groups and the three poorest tenfold are contributing only to 12 percent of the manufactured products. This figure indicates that the manufacturing sector in Iran is significantly dependent on the high income groups. These people, in the case of the ongoing technological gap between the domestic and imported products, will be more and more demanding imported goods.

Now, we can analyze the pattern of expenditure for different manufactured sub-groups. For this purpose, we divide the manufacturing products into the four groups of food industries, clothing, non-durables (other than the last two groups) and durables. As can be seen from Figure 3, about 50 percent of the households' expenditure on manufacturing products is spent on the food industry, 18 percent on clothing, 10 percent on non-durables and 22 percent on durables.

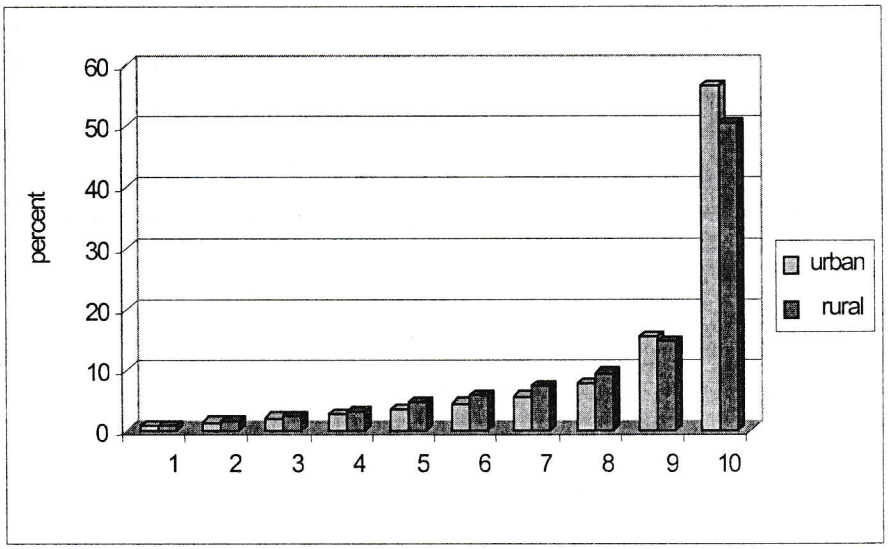
Figure- 3. The composition of expenditure on manufacturing products



We can see from Figure 3, that the share of household expenditure on durables for the rural households is much lower than that of the urban households. This is 13 percent for the rural households as compared with 22 percent for the urban households.

The pattern of expenditure for different income groups is very different. This difference becomes most significant, when we consider the durable goods. For these products, the poorest tenfold income group, spends only one percent of the total expenditure on durable goods, while the richest income group spends 56 percent (Fig. 4) of the total expenditure on durable goods.

Figure- 4. The share of each income group in the spending on durables



We can see from Figure 4 that the tenfold nine and ten, contribute to about 72 percent of the total expenditure on durable goods. If we combine the results represented by Figure 4 with those of Figure 3, we can see that the overall share of households' expenditure on durable goods is relatively low (about 10 percent) and this low level of expenditure is also distributed very unequally between different income groups.

5. Demand Estimates

Table- 2. Price and income elasticities

Product group	Income elasticity	Price elasticity
Non-manufactured foods	0.68	-0.10
Manufactured foods	0.82	-0.20
Clothing	1.29	-1.05
Non-durables	0.76	-0.40
Durables	1.64	-0.15
Housings	1.10	-0.31
Services	1.21	-1.02

According to this table, food industries and non-durable manufacturing products have the income elasticity of less than one. On the contrary, durable goods have the biggest income elasticities which are significantly more that one. As we know from the experience of the South East Asia economies, durable goods and clothing have been the main engines of industrial growth during last fifty years. This is due to the characteristics of the income demand elasticities of these goods being more than one and also following the export oriented strategy by these countries.

6.Conclusion

In this paper, by finding a map between items on households' consumption and the four digit ISIC groups, we obtained the pattern of household expenditure on each product group. On this basis, we found that 50 percent of the urban households' expenditure and 63 percent of the rural households' expenditure is spent on manufacturing products. We also observed that within different income groups, the share of expenditure on indurable products does not vary very much and it is within the range of 47 (for the poorest) and 54 (for the richest). But, when we consider the existing inequality of income between different groups, we find that the two richest tenfold groups contribute to about 43 percent of the total expenditure on

manufacturing products and hence the remaining 80 percent of total households contribute to about 47 percent of the manufacturing demand.

When we focus on the distribution of expenditure across different manufacturing sub-sectors, we find that about 50 percent of the household expenditure is spent on the food industries. The pattern of household expenditure on durable goods is highly unequal and the two richest tenfold income groups are demanding more than 70 percent of the total expenditure on the durable manufacture goods.

The results of our estimates on the income and price elasticities are consistent with theory and also with the findings of other related works on this issues for Iran[1]. Income elasticities for non-manufacturing foods and manufacturing foods and also other non-durable manufacturing products are less than one and income elasticities for durables and clothing are greater than one.

1. See for example, Khakban (2000) and Soori and Mashyekh (1998).

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