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Should all Iranian Citizens Receive the Same Subsidy Rebate?

Molana[-], Hassan and
Rahimi[—], Abolfazl

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Abstract

The 'Subsidy Targeting Project' was introduced by the government of Iran in 2010 to ease the impact of removing price subsidies (carried out as part of recent economic liberalization reforms). Under this scheme, regardless of their socio-economic characteristics, Iranian citizens residing in Iran receive the same amount of cash rebate (currently 455,000 Iranian Rials per month). This paper uses the equivalence scales approach to query the fairness of this policy exercise. We use Iran's Household Expenditure and Income Surveys datasets for 1984-2007 (compiled annually by the Statistical Centre of Iran) to estimate the Engel-curve-based equivalence scales which take account of the main household features: size, geographic location, and a number of characteristics of head of household. Our estimates suggest a clear profile of redistribution which questions the fairness of disregarding households' characteristics in such a large scale redistribution exercise which was primarily designed to offset the welfare impacts of removing price subsidies.

Keywords: *Cluster regression, Demographic features, Engel curve, Household equivalence scale, Iran*

JEL Classification: *I30, I31, I32, I38*

[-] University of Dundee, UK
[—] Contact Author: Abolfazl Rahimi, University of Shahid Beheshti – Faculty of Economics, Tehran, Iran; e-mail: ab_rahimi@sbu.ac.ir

1. Introduction

Depending on their circumstances, Iranian households can be entitled to financial support from various sources within the context of country's welfare state. However, an examination of the approach followed by the relevant authorities (from official, charitable or religious institutions) reveals that circumstances exist in which the distribution system lacks the essential characteristics that are required from a sound practice and an equitable welfare state. The purpose of this paper is to highlight the recent case of redistributive policy involving the reduction of subsidies on essential goods, through using the household survey data for 1984-2007 for which the raw data comes from the Statistic Centre of Iran to illustrate the need to modify the current official redistribution welfare policy substantially.

The welfare system in the Islamic Republic of Iran is quite complex with various governmental, non-governmental and par-governmental welfare organizations operating side by side. Examples of these include the state welfare organization (*Behzisti*), the charitable trusts established mainly after the 1979 revolution which operate independently from the government, e.g. Imam Khomeini Relief Committee (IKRC), Foundation of the Oppressed, etc. and other government dependent but non-governmental organizations such as the Social Security Organization (SSO) and Medical Services Insurance Organization (MSIO). These institutions provide a variety of services, from health care to housing, education and pensions and some financially aid eligible. Therefore, we require a system for assessing who should be paid and how much.

The SSO, which has been active for more than 50 years, is the largest social insurance institution in Iran. It covers the greatest proportion of the country's population: 27,890,166[1] people were covered in 2005, which is 41% of the population in that year[2]. According to the country's social security

1. Social Security Organization statistical information for 2005, obtained from their website at http://www2.tamin.org.ir/web/sso-en/gi/gs
2. The population for year 2005 was obtained from the Economic Time Series Database of the Central Bank of Iran site at http://tsd.cbi.ir/ and the proportion was calculated.

legislations, any person who earns a living by working is entitled to receive coverage for himself and his dependents through this organization. This includes salaried workers, wage earners and self-employed people. The premium for each insured person is 30% of his total income broken down into contributions made by the employees (7%), their employers (20%) and the government (3%). The SSO covers for unemployment, medical care, pensions, maternity leave, disability and sickness among other things. Retirement benefits (pensions) paid by the SSO are not fixed and pensions are increased almost every year in line with inflation. The amount by which pensions are increased is also based on the minimum and maximum wage set by the government each year. No other factors are taken into account in adjusting the benefits.

The IKRC is one of the country's largest charitable organizations and is guided directly by the office of Leadership[1]. Its function is to support poor families by providing them with financial assistance and services. According to IKRC's 2009 annual statistical report[2], the institution provided coverage for more than 11 million people across Iran. IKRC's income (revenue) comes from donations made by the Iranian Leader (from funds at the disposal of the Office of Leadership), the public (through, e.g. alms boxes and other donations), government funds and IKRC's own business activities. Its total income was 4093.4 billion Iranian Rials (approximately 415 million US Dollar[3]) in 2009, 27.9 % of which came from charity boxes, 5.1% from other donations made by the public, 21%7% revenue from committee's businesses and 45.3% from other sources. Additionally, it also had other incomes amounting to 2349.4 billion Iranian Rials from unrecorded sources which

1. Constitutionally the Office of Leadership is the highest official in the Islamic Republic of Iran; Article 113 defines the status of this office and Article 110 outlines Leader's responsibilities and authority.
2. All statistical information obtained from the Imam Khomeini Relief Committee annual statistical report (2009), available at http://www.emdad.ir/gozareshat/amar.asp (Farsi).
3. The exchange rates used in the conversion of Rial to US Dollar is these explanations correspond to either the annual average rate or the spot rate at the date, as relevant, obtained from central bank of Iran http://www.cbi.ir/exrates/rates_en.aspx.

were not entered in the accounting documents due to lack of records. IKRC's income has increased substantially over the years, by 21%%%% from 2005 to 2009.

The majority of Iranians is Muslims and as such is under religious obligation to make mandatory donations (*Zakat*, *Khoms*, and *Fitra)*. These are usually paid to the local clergymen or imams and are redistributed among the poor. This is yet another example of the cash distribution in the Islamic country of Iran. Those eligible for payments are decided upon according to the Sharia laws of Islam. However, the amount paid is not specified and is at the discretion of the clergyman in charge. The clergymen are also in a position to use their discretion in distributing any other non-obligatory charitable donations that they receive. In addition to *Zakat*, *Khoms* and *Fitra*, there is a perpetual form of charity called *Waqf* which is a religious endowment in Islam whereby a person donates an asset, usually a property, to be held and managed (but not sold) by a charitable trust and its proceeds be used for charitable purposes (which may or may not have been specified by the donor). *Waqf* is a common practice in Iran, and its perpetual and redistributive characteristics inspire sustainability.

The above explanations involve examples of direct (either one off or regular) lump-sum payments to households which, in most cases, are discretionary and lack a sound system based on principles of welfare economics. In addition to such direct lump-sum payments, a major component of the welfare system in Iran is based on subsidy schemes whereby the government ensures prices of certain necessities א e.g. foodstuff such as wheat, milk, sugar, rice, etc. and utilities such as fuel (including petrol, gas and gasoline), water, electricity, etc. respectively amounting to 4% and 10% of GDP in 2003, see Hakimian (2008, p20 and 21) א do not exceed the so called "affordable thresholds". Until recently, these schemes were implemented by successive regimes/administrations without any compromise and were considered as 'priority items' in government budget. However,

following the approval of the Subsidy Targeting Act[1] by the parliament in 2010, the government started cutting price subsidies for energy and food-stuff and replaced them with direct lump-sum subsidies. This Act, which was legislated on the 5th of January 2010, has 16 Articles and 16 Clauses. Subject to Article 1 of this act, the government is required to reform its energy prices to generate between 100 billion and 200 billion Iranian Rials (approximately 10 to 19 billion US Dollar) in revenue (Clause 3). Article 7 clearly states that the government ought to distribute 50% of the net revenue thus generated in the following two ways: (i) Monetary and non-monetary payments to head of households based on their incomes; and (ii) Implementing extensive social security programs. In Article 7 (1), the government was given three months from the date of the legislation to present the necessary guidelines to specify how much and in what way these payments would be made to households. The Subsidy Targeting Act was implemented on the 22nd of December 2010, when the government reduced the price subsidies of energy products א petrol price rose from 4000 (0.38 US Dollar) to 7000 Rials[2] (0.67 US Dollar), gasoil price from 160 (0.01 US Dollar) to 3500 Rials (0.34 US Dollar) א and at the

1. The process is outlined in detail in the 5th Five-year Development Plan of the Islamic Republic of Iran (pages 549-557), available from http://www.spac.ir/Portal/File/ShowFile.aspx?ID=90fa4381-ca1c-4d41-885a-8e889d572e3d (in Farsi). As mentioned in Chapter 2, the structural adjustment policies of the IMF replaced the 1st Five-year Development Plan with recommendation for implementing free market policies. Guillaume et al. (2011) provide a detailed account of the economic and technical issues involved in the planning and implementation of the recent reform that eliminated (or drastically reduced) the subsidy for domestic energy and agricultural prices and recommend, amongst other things, that "*the main immediate challenge facing the authorities is, however, to allow a progressive pass-through of higher energy prices by eliminating administrative price controls and reducing excessive and arbitrarily set import or export tariffs, while controlling inflation by coordinated and tight credit, fiscal, and exchange rate policies. Maintaining macroeconomic stability is essential to avoid a rapid erosion of the benefits of the reform. At the same time, new product prices should reflect the adjustment in product mix from Iranian companies and changes in consumer demand away from products and services requiring a lot of energy towards more energy-efficient goods and services*" (pp. 21-22).
2. http://www.bbc.co.uk/persian/iran/2010/12/101218_ ahmadinejad_subsidies.shtml (in Farsi) is the source used for this price.

same time paid every registered Iranian household (72 million individuals have registered to date) 445,000 Rials (43 US Dollar) per month for each member of household in lump-sum. These payments have continued in the form of monthly direct debits and the amount has increased to 455,000 Rials (44 US Dollar) per household member. Obviously, in principle, this extra cash would help to increase the welfare of the household as it increases its disposable income. However, since it does not take into account households' demographic features (e.g., size; number, age and gender of children; age and gender of head of household; residential features; etc.) and its level of income, the policy is unlikely to be equitable.

Given that this project was the biggest of its kind in the history of the Islamic Republic of Iran, and that it is bound to affect the well-being of a large proportion of the population, it is rather surprising that it was introduced in such haste and without thorough planning. The least one would expect of such practices is that they take account of the two most basic household features (i) sizes, and (ii) areas of residence. But an appropriate redistribution policy will have to go beyond this and use the household equivalence scales which are one of the most useful tools developed in welfare economics. This is because they can be used to estimate the amount by which incomes of different types of households ought to be adjusted so as to bring their welfare to the level enjoyed by a reference household type (representative household), where socioeconomic and demographic factors are used to classify household types. Equivalence scales can also be used to determine how to redistribute a given amount of money among households such that any change in their welfare levels are taken into account - for instance, when compensating financially for losses incurred due to implementation of new government policies or as a result of major mishaps or natural disasters, etc. It can therefore be argued that the recent Subsidy Targeting Project in Iran (as well as other welfare-based benefits or payments such as those mentioned above) would be improved by making use of equivalence scales in estimating the amount that each household type receives. In this paper we use the Household Expenditure and

Income Surveys (HEIS) of 1984-2007, obtained from the Statistical Centre of Iran (SCI) which is the organization responsible for conducting these surveys. We show that the picture which emerges where demographic features such as household size and geographic location and some characteristics of head of household are taken into account suggests that the current system of redistribution followed by the Subsidy Targeting Project (which pays the same amount to each member of all types of household regardless of their characteristics) needs to be modified substantially.

This paper is organized as follows: Section 2 reviews the relevant theoretical studies and gives a summary of a selected number of recent applied studies. Section 3 gives the results which include the augmented Engel curves for rural and urban households. In Section 4 the different household equivalence scales are estimated using the Engel approach. Section 5 gives the conclusion and anticipates the analysis carried out in this paper.

2. The Background and a Brief Review of the Relevant Literature

An equivalence scale is a measure of the cost of living of a household of a given size and demographic composition relative to the cost of living of a reference household when both households attain the same level of utility or standard of living (Lewbel and Pendakur, 2006). In other words, an equivalence scale is simply a coefficient showing the ratio of the cost of living of a given household to the cost of living of a reference household as long as both households enjoy the same standard of living or welfare level. Thus, equivalence scales can be used to estimate the monetary amount a certain household would require in order to maintain the same level of welfare as before when its circumstances change. This change in circumstances could be due to an alteration in the demographic features of the household (e.g., a new baby, or even a move from urban to rural area) or might be the result of a new

policy affecting the household (e.g., introducing child benefits, eliminating price subsidies, etc.).

The history of equivalence scales dates back to 1895 and Engel's observations of the relationship between households' income and their share of expenditure on food. He suggested that since it was observed that, for any given household composition, richer households on average spent a relatively smaller proportion of their income on food (compared to poorer households), the inverse of food expenditure shares could be taken as a welfare indicator for comparing households. Based on this observation, households of different size or composition which have the same food expenditure shares are taken to have the same level of welfare. Therefore, equivalence scales derived using the Engel method are basically ratios of incomes of two households with the same food expenditure shares. More explicitly, consider two households which are indicated by subscripts h=1, 2 with size s_2 A s_1 and income y_2 A y_1. If these households have the same food expenditure shares, $w_2 \cong w_1$ then the income ratio y_2 / y_1 A1 can be used as the equivalence scale since it gives the multiplier which adjusts the income of household 1 when its size grows from s_1 to s_2 so that it can maintain its welfare level intact.

This method of calculating the equivalence scale is based on the Engel curve which can be argued to be a specific, restricted, representation of the Marshallian demand curve where prices are held constant and demand varies with income. The first models of this type proposed for empirical analysis can be found in Working (1943) and Leser (1963) which postulated a general functional form

$$\frac{E_{i,h}}{E_h} \cong w_{i,h} + \ln E_h, D_h, \tag{1}$$

where the subscript i refers to the category of expenditure (food, etc.), E_i is the actual expenditure on category i, E is the total expenditure on all goods and services, $E_h \cong \sum_i E_{i,h}$, and D is a vector of socio-demographic variables

(size, age of children, location, head of households characteristics such as education and employment status, age, gender, etc.). The shape of the Engel curve for category *i* would therefore depend on the functional form of w_i. Paris and Houthakker (1955) found that essential goods and luxury goods could be appropriately modeled using a semi-log and a double-log regression equation, respectively, i.e.

$$E_{1,h} \cong \delta_1 . \ \varepsilon_1 \ln E_h . \ u_{1,h}, \quad h \cong 1,...,H \tag{2}$$

$$\ln E_{2,h} \cong \delta_2 . \ \varepsilon_2 \ln E_h . \ u_{2,h}, \quad h \cong 1,...,H \tag{3}$$

where subscripts 1 and 2 refer to essential goods and luxury goods respectively and u_i is a random disturbance term. Bewley (1982) proposed using the double-log model in (3) above for all types of goods but re-parameterizing it so that the dependent variable is expressed as the expenditure share, thus in an N-good case we use

$$\ln E_{i,h} / E_h \cong \delta_i . \ + \varepsilon_i \, 01, \ln E_h . \ u_{i,h}, \ i \cong 1,...,N; \ \ h \cong 1,...,H \tag{4}$$

Van Ginneken (1982) used the model in (4) for food expenditure and introduced the household size as an additional explanatory variable. Engel's approach has been generalized with respect to the use of share of expenditure on food, by replacing the latter with 'food and clothing', 'adult goods', etc.[1]

One of the main shortcomings of the studies based on Engel's method is that they fail to take account of households' socio-demographic features. In addition, it is argued that Engle's method does not explicitly correspond to any well-defined demand system derived from utility maximization or cost minimization. Hence, other methods of constructing equivalence scales have

1. See Watts (1967) and Seneca and Taussig (1971) for details.

been suggested which are based on well-defined demand systems and involve demographic variables [e.g., Paris and Houthakker (1955), Barten (1964), Gorman (1976), Lewbel (1985) and Pendakur (1999) among others. In more recent literatures, preferences and individual inter-household utilities have also been taken into account][1]. In general, however, the existing studies can be usefully classified on the basis of their empirical focus which may be divided into the following:

(i) Calculating the cost of living of a household;

(ii) Estimating the cost of living associated with an additional child;

(iii) Choice of the reference household; and

(iv) Measurement of households' welfare.

The latter is clearly the most crucial issue and one of the main distinctions between different studies is what they consider to be a good proxy for households' welfare. Some express welfare index in terms of the (inverse of) expenditure shares of certain essential commodities (e.g., Engel's food expenditure shares, Rothbarth's adult goods expenditure shares, etc.) and others measure welfare in terms of the indirect utility based on expenditure function approach.

3. Estimating the Engel Curve for Iran

The SCI that was founded in 1952 and the first survey of household budget from SCI refers to 1963 provided the raw data, but supplied the probability weights for only a limited number of years. The lack of probability weight for a year means that data for that year cannot be used in the analysis. This is because the robustness of any type of statistical analysis depends on the use of correctly calculated probability weights that eliminate (or reduce) the sampling bias.[2] (We propose a method of constructing the missing probability

1. See Jorgenson and Slesnick (1987), Lewbel (1989), Blackorby and Donaldson (1993) and Donaldson and Pendakur (2004, 2006)
2. See Deaton (1997) for an in depth discussion of the technical issues regarding the micro-econometric issues involved in the analysis of survey data.

weights and use this method to construct the weights for the whole period. We saw that for those years that official weights are provided by the SCI, the two weights are identical. They are available on request.)

The surveys are conducted annually on randomly chosen urban and rural households from all regions across the country. In total 264,988 rural and 254,605 urban households were surveyed from 1984 to 2007, an average of about 11,000 rural and 10,600 urban households each year. The survey data, which is obtained through questionnaires, contains information on households' demographic features, place of residence features, expenditures and income. The dataset contains information on more than 500,000 households in Iran for a period of 24 years, involving a total of over 370 million data items.

In this section we estimate the Engel curve for Iran using the household survey data for the period 1997 to 2007. More specifically, for each year t =1997, 1999, 2001, 2003, 2005, 2007, we estimate different versions of the regression equation

$$w_{h,t} \cong \delta_t \,.\, \varepsilon_t \ln E_{h,t} \,.\, u_{h,t} \qquad (5)$$

By allowing for households' characteristics, where w and E as before denote the household-level of food expenditure share and total expenditure, respectively, and the effects of the socio-demographic factors which are taken into account are reflected in the coefficient estimates.

Table 1 shows our first set of estimates where we use the full sample and do not distinguish between households (i.e. no characteristics dummies or socioeconomic factors are included in the regression equation as additional explanatory variable).

The estimation method is weighted least squares using the survey probability weights. N_t is the number of households in the sample. The numbers in parenthesis are t-ratios based on cluster and heteroscedasticity

robust standard errors. The pooled regressions include, as additional explanatory variable, the logarithm of the consumer price index which captures, to some extent, the impact of inflation across the years (the corresponding coefficient and t-ratio is not reported but are available on request). A year dummy was also included in the pooled regression but its effect was insignificant and hence it was removed.

Table 1: Estimates of the General Engel Curve Coefficients

	1997	1999	2001	2003	2005	2007	pooled
$\hat{\varepsilon}_t$	-.0845218 (12.34)	-.0829105 (15.86)	-.0918525 (13.38)	-.0948273 (17.83)	-.0979648 (21.16)	-.0968582 (18.41)	-.0907514 (17.14)
δ_t	1.738806 (16.81)	1.730351 (20.74)	1.877047 (17.11)	1.957894 (21.37)	2.019342 (24.97)	2.015188 (21.15)	31.03167 (0.013)
R^2	0.1677	0.1803	0.2565	0.2586	0.2970	0.3024	0.2755
N_t	21809	27343	26844	23088	26796	31179	288533

Source: Author's finding

All of the coefficients are significant and of similar magnitude over the years and, as expected, there is an inverse relationship between the *w* and ln*E*: as the total expenditure levels rises the food expenditure share falls, hence confirming the existence of a robust Engel curve relationship. It is worth noting that the estimates for ε are not dissimilar to those reported in the literature. For instance, the estimates reported by Liu and Chern (2001) are in the neighborhood of -0.095, those reported by Deaton & Muellbauer (1986) for Indonesia are around -0.1, and those presented in Deaton (1997) for India and Pakistan are -0.12 and -0.1, respectively. The slight positive trend in the magnitude of estimates for ε_t suggests that, ceteris paribus, the welfare level of households have improved over the years.

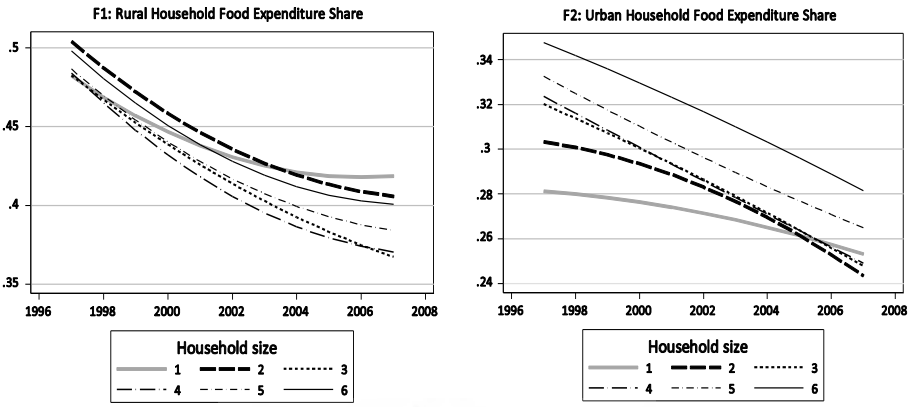
Given that the equivalence scale analysis based on the Engel curve rest on the assumption that food expenditure shares are inversely (and monotonically)

related to the welfare levels, in Table 2 below we depict the behavior of food expenditure shares over time, separately for rural and urban households of different sizes. These figures indicate three important points: (i) given they depict a reduction in the food expenditure share over the years, one might take this as a preliminary evidence, based on Engel's observations, for an increase in the welfare levels of households over the period; (ii) the size of household matters, as it shifts the food expenditure share considerably; and (iii) the urban-rural difference is clearly present, as on average the rural households of all sizes tend to have a higher food expenditure share than urban households. In fact, as the graphs indicate (on average) the minimum level of food expenditure share for rural households is larger than the maximum food expenditure share of the urban households.

Each graph depicted in the above figures shows the non-linear fit for the corresponding scatter-plots of share of expenditure on food against total expenditure.

Thus the welfare level of rural households' is, in general, below that attained by urban households. In fact, on average, if households' total expenditure is proportional to their total disposable income, then urban households enjoy much higher income levels compared to rural households of the same size. Since disposable income too is considered as a measure of welfare (approximating the indirect utility), this evidence further supports the above findings indicating higher welfare levels for urban households.

Table 2: The Engle Welfare Index, 1997-007



Finally, it is worth noting that as Table 2 shows, the graphs of rural households' food expenditure shares (unlike those for urban households) are falling but at a decreasing rate. This could be taken as an indication that while there has been continuing improvement in rural households' welfare level, the extent of this improvement has been declining over the period. As a result, the evidence presented in Table 2 illustrates a widening of welfare gap between urban and rural households. In order to account explicitly for the inter-household heterogeneities (which affect the determination of the share of food expenditure, as observed in the above graphs), we augment the Engel curve regression equation (5) above with different variables representing households' socio-demographic characteristics. The dataset we have processed contains over 22 variables for demographic features. In what follows, we introduce the most important factors amongst these in a number of stages. We start with introducing households' locality and size which we believe to be the most important factors, hence generalizing the model as:

$$w_{h,t} \cong \delta_t \,.\, \varepsilon_t \ln E_{h,t} \,.\, \varphi_t S_{h,t} \,.\, \mu_t RU_{h,t} \,.\, u_{h,t} \qquad (6)$$

Table 3: Estimates of Parameters of Equation (6)

The Engel Curve Coefficients, Allowing for Household Characteristics

	1997	1999	2001	2003	2005	2007	Pooled
$\hat{\varepsilon}_t$	-.0760156 (15.73)	-.0807464 (17.43)	-.0906661 (23.81)	-.0916729 (21.40)	-.0954811 (32.28)	-.0922549 (23.10)	-.0871255 (24.33)
$\hat{\varphi}_t$	.0162458 (11.46)	.0175548 (13.63)	.0196724 (17.54)	.0190023 (23.77)	.0182819 (19.79)	.0193272 (10.93)	.0179277 (17.32)
$\hat{\mu}_t$	-.1120452 (12.70)	-.0895434 (12.42)	-.0772919 (16.12)	-.0781933 (14.28)	-.0755964 (21.58)	-.07972 (17.90)	-.0839993 (20.79)
δ_t	1.593557 (22.99)	1.665827 (22.82)	1.81521 (28.75)	1.86888 (24.17)	1.949189 (35.45)	1.908899 (25.69)	14.71354 (1.16)
R^2	0.3428	0.3266	0.4074	0.4033	0.4263	0.4337	0.4102
N_t	21809	27343	26844	23088	26796	31179	288533

See notes to Table1.

where S is the household size (total number of household members[1]) and RU is a location dummy to distinguish between rural and urban place of residence (RU=0 if rural and RU=1 if urban). Table 3 reports the corresponding coefficient estimates.

The above evidence shows that these additional regressors have significant impacts with the expected sign: the predicted welfare levels turn out to be higher for urban and/or smaller households. Also, comparing the estimates in Tables 1 and 3 shows that the inclusion of S and RU raises the R^2 of the regression considerably and reduces, albeit slightly, the size of $\hat{\varepsilon}$ for all t, hence correct any biases due to omitting these variable. Next,

1. In this study we limit the sample to $0<S<7$, hence excluding all households for which $S>6$. The specification of (6) and all the regression equations that follow is more appropriate in the context of interpreting the impact of the size as a simple shift factor that changes the intercept which is the purpose of the analysis of this chapter. The alternative specification which takes account of the household size is one in which $\ln S_h$ rather than S_h is used as an explanatory variable. The latter allows the re-parameterization so that the dependent variables are per capita household expenditure and size - see Deaton and Muellbauer (1986) for an application.

we generalize the model by introducing two more explanatory variables to capture the role of the main characteristics of head of household, namely gender and age of head of household. Hence we estimate

$$w_{h,t} \cong \delta_t \cdot \varepsilon_t \ln E_{h,t} \cdot \varphi_t S_{h,t} \cdot \mu_t RU_{h,t} \cdot \gamma_t GH_{h,t} \cdot \pi_t LH_{h,t} \cdot u_{h,t} \quad (7)$$

where *GH* is a gender dummy (*GH* = 1 if head is male and *GH* =0 otherwise) and *LH* is a literacy dummy (*LH* =1 if the head is literate and *LH* =0 if head is illiterate). The coefficient estimates for (7) are given in Table 4 and strongly suggest that these characteristics are pertinent: the coefficient estimates of these additional explanatory variables are significant and their inclusion raises the R^2 of the regressions. That we find $\hat{\pi}$? 0[1] is uncontroversial since one would expect, a priori, that *ceteris paribus* a household head's literacy raises the predicted welfare level of household. On the other hand, $\hat{\gamma}$ A0 this implies that, *ceteris paribus*, Iranian households with female head are better off. This evidence can nevertheless be plausibly interpreted by drawing on the difference in the taste of head that determines the expenditure pattern of household and postulating the behavioral assumption that women are on the whole likely to emphasize a more even allocation of expenditure across various categories and hence spend proportionally less on food relative to men.

We also find that, amongst the explanatory variables added, the coefficient for the rural/urban dummy has the highest value, singling out urbanization as the most important factor. However, this evidence should be interpreted with care. On the one hand, urban households enjoy a better provision of infrastructure and the availability of various activities reduces the importance of food in the budget. This interpretation therefore suggests that the lower food expenditure share of urban households genuinely captures a higher welfare level. On the other hand, it is accepted that living in urban areas adds

1. For more details we can conjecture that since the coefficient of the literacy of head is negative (Table 4), in other words it has an inverse relation with food expenditure share, then when the head of household is literate food expenditure share comes down and welfare increases.

significantly to certain costs such as commuting, clothing, etc. which implies the opposite. Whilst the question of the impact of urbanization on welfare, and hence policies on urbanization and the migration of rural households to urban areas are important in developing countries such as Iran, these issues lie beyond the scope of this thesis and we only use this opportunity to highlight the fact that such questions deserve further thorough investigation.

Table 4: Estimates of Parameters of Equation (7)
The Engel Curve Coefficients, Allowing for Further Household Characteristics

	1997	1999	2001	2003	2005	2007	Pooled
$\hat{\varepsilon}_t$	-.0763536 (16.29)	-.0828123 (17.25)	-.0926034 (27.55)	-.0924092 (21.94)	-.0944103 (31.64)	-.0913543 (23.28)	-.0873924 (25.72)
$\hat{\varphi}_t$	.0142931 (10.44)	.0158819 (12.75)	.0180304 (15.76)	.0176215 (22.45)	.0168644 (18.82)	.0179749 (10.54)	.0163809 (16.32)
$\hat{\mu}_t$	-.1075771 (12.80)	-.0874616 (12.25)	-.075381 (15.82)	-.0759665 (13.89)	-.0721037 (19.37)	-.0767322 (17.24)	-.0811183 (20.13)
$\hat{\gamma}_t$	.0619941 (13.59)	.0555569 (13.15)	.0521069 (7.33)	.039355 (8.91)	.0343893 (13.99)	.031322 (9.36)	.0438186 (20.28)
$\hat{\pi}_t$	-.0199599 (5.00)	-.0084188 (1.97)	-.0089625 (3.37)	-.0088636 (3.36)	-.0189183 (5.27)	-.0175484 (6.38)	-.0145122 (6.68)
δ_t	1.562119 (23.20)	1.661646 (22.19)	1.812966 (31.68)	1.856629 (24.71)	1.916687 (34.83)	1.881031 (26.02)	14.73676 (1.18)
R^2	0.3527	0.3342	0.4152	0.4078	0.4311	0.4379	0.4158
N_t	21809	27343	26844	23088	26796	31179	288533

See notes to Table 1.

Finally, it is worth noting that the addition of the head of household characteristics do not have a substantial, or noticeable, impact on the estimates of the slope coefficient $\hat{\varepsilon}_t$. Hence, as one would expect, these two variables seem to be orthogonal to the explanatory variables included in equation (6).

The above empirical analysis provides sufficiently strong evidence in support of our claim that a fair and equitable welfare policy ought to distinguish between households by taking account of their characteristics when, for instance, lump-sum transfers are used for compensating the impact of removing price subsidies. In our analysis so far, however, we have only

included a subset of the characteristics that are available in the dataset which are available for all members of the household including the head, on a maximum of 15 variables among which are age, gender, nationality, literacy and occupation of household members and their relationship with the head of household. This is because we wish to illustrate the role of these characteristics while keeping a manageable number of cases when constructing the equivalence scale measures which we discuss below.

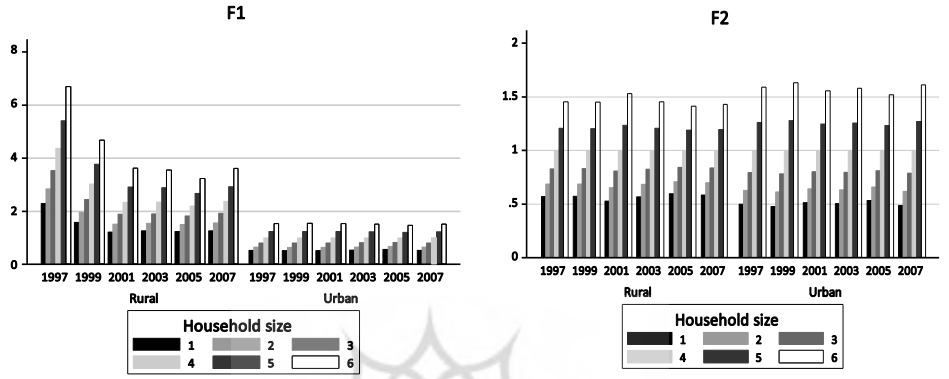
In order to emphasize that a wider range of such characteristics is pertinent and that a thorough welfare scheme should fully investigate their empirical relevance in affecting households' expenditure patterns, we generalize our Engel curve regression equation by including more demographic variables [Locality (rural and urban); gender, literacy and employment status of the head of household; wife's literacy; number of parents present in the household; number of children; number of other males (son-in-law, etc.) and number of other females (daughter-in-law, etc.). All of variables and their significant coefficient estimates are available on request]. To conclude, these results show that the demographic variables play a significant part in predicting welfare levels, although their effects vary and some variables have greater influence. This illustrates the complexities involved in evaluating or predicting welfare levels, as a variety of different factors need to be taken into consideration.

5. Equivalence Scales for Iranian Households

The Engel curve estimates reported above can be used to construct household equivalence scales is defined: $E_h / E_r \cong ES(h,r) \cong exp\{\hat{\delta}_r 0\, \delta_h, / \hat{\varepsilon}$ where E refers to total expenditure of household; subscript h refers to one household (any selected household) and subscript r refers to the reference household; δ and $\hat{\varepsilon}$ are coefficient estimations in a regression equation (5). Table 5 shows our preliminary estimates of these where $\delta_{h,t}$ and $\hat{\varepsilon}_t$ are those reported in Table 3 which only allow for the size and locality to affect the welfare level of households, that is:

$$\hat{w}_{h,t} \cong \delta_t \cdot \hat{\varepsilon}_t \ln E_{h,t} \cdot \hat{\varphi}_t S_{h,t} \cdot \hat{\mu}_t RU_{h,t} \quad (8)$$

Table 5: The Households Equivalence Scales, 1997-2007



For F1 (the left panel), the reference household is the 4-member urban household for both urban and rural estimates. For F2 (the right panel), the reference household is the 4-member urban household for urban estimates and 4-member rural household for rural estimates.
Note: F1 and F2 are based on the same regressions as reported in Table 1 above while F3 and F4 are calculated using separate regressions for rural and urban households which exclude the RU dummy.

We have chosen to focus on size and locality only since the results help to illustrate better the importance of socio-demographic factors. For each of the years t =1997, 1999, 2001, 2003, 2005, 2007, the bar charts in Table 6 show the relevance of the household size relative to the reference household.

In figure F1 (on the left-hand-side panel) we have taken the reference household for each year to be the 4-member urban household that a high proportion of the population live in urban areas and the average size for urban households is 4.56 [1] . Figure F2 uses as reference household the 4-member urban and rural households separately for each. Thus the ES for

1. This calculated by authors from the dataset. Calculations are available on request.

urban households are identical in both F1 and F2 but, as we shall explain below, this re-basing of the rural ES and the comparison between the two figures reveal crucial information for formulating welfare policies.

The results which emerge from examining the above evidence on equivalence scales (ES) can be summarized as:

(a) In all cases, ES is increasing with size. However, the impact of the size is (i) less than proportional, and (ii) is larger at higher for bigger households. For example, on average, when the household size increases from 1 to 2 members ES rises by 30% but when it increases from 3 to 6 members ES rises by 90%. One explanation for this could be the possibility that larger households are generally more mature and tend to include older children whose food consumption level is relatively higher. Consequently, the response of ES to size is higher the higher is the household size. On the whole, these results confirm the presence of economies of scale for food consumption in Iranian households[1] which is a crucial factor to be considered by the policy makers.

(b) For urban households, the pattern of ES does not change over the period considered. This evidence of stability across years is an important factor for policy makers as it indicates that significant adjustments are not required over a time span of 10 years.

(c) For rural households, we find three interesting results:

(c1) In all cases shown in figure F1, the values of ES are much larger than their urban equivalent. This finding is consistent with the expectations that urban households enjoy a relatively higher welfare levels and that rural households need bigger compensation to reach the reference household's welfare level which is a 4-person urban household.

1. This is a somewhat common phenomenon. See, for instance, Deaton (1997) for similar evidence on Indonesia. However, as Deaton stresses, the complexity of the relationship between households' size and their food consumption tends to vary depending on their particular circumstances and factors such as households' poverty level or their rural/farmer status can alter the relationship significantly.

(c2) Again as figure F1 shows, the values of ES have been decreased over the years: they are notably larger in 1997 and have been decreased in 1999 and then seem to settle to a stable pattern at lower values in the rest of the period. One explanation for this finding could be the possibility that prices differ regionally and that this difference was more enhanced during the years of higher inflation (the relative graphs are available on request). Unfortunately, there is no data on regional price levels which we could use to test this conjecture.

(c3) As figure F2 shows, the discrepancy between urban and rural households in figure F1 seems to almost disappear when we change the reference household for the calculation of ES for rural households. This evidence to some extent supports the points raised in (c1) and (c2) above.

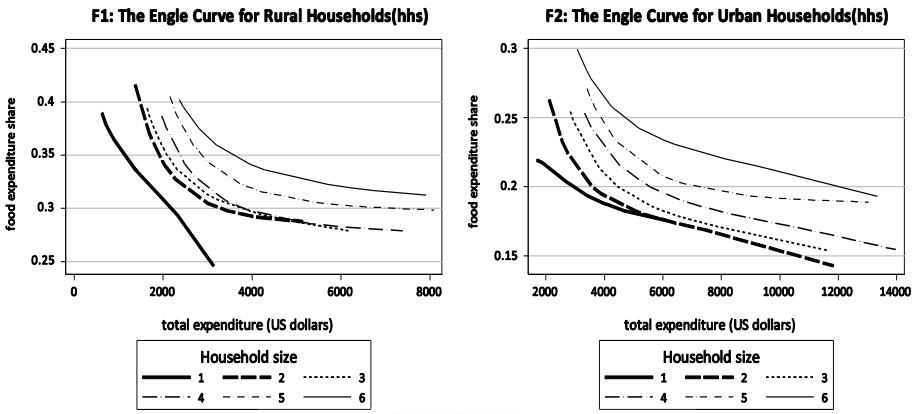
The main policy implications of the above is that there is a significant urban-rural dichotomy which needs to be addressed both in terms of welfare levels as well as the different impact of factors such as inflation at regional levels. Also, setting aside the urban-rural issue and focusing on the rural case separately, on the whole a similar policy can be applied to both urban and rural households and the stable pattern of the ES over the years suggests that these policies do not need to be adjusted in the short term to even out the different impact of various factors across the years. However, addressing urban and rural areas separately has the big disadvantage that the welfare gap between the two may grow and for this reason policy makers need to pay attention to both ES calculations presented in figures F1 and F2 to monitor the urban-rural gap Having illustrated the main issues concerning the calculation and use of ES by means of analyzing the preliminary ES indices which only take account of the households' size and their urban/rural locality of residence, in the rest of this section we briefly examine the equivalence scales corresponding to the more general Engel model in equation (7), which we construct using the

estimates reported in Table 4 (the results are available on request in the form of bar chart. The reference household used for urban and rural cases: "*the 4-member urban household with literate male head*" and "*the 4-member rural household with male literate head*" for rural households.[1]). The bar charts clearly support the existence of economies of scale in Iranian households' food consumption and show a relatively wide urban-rural difference. But, in addition, they also indicate that demographic factors do matter: for instance, the ES coefficients are markedly affected by the literacy and gender of the head of household. In particular, as one would expect, households with illiterate head have a relatively larger ES and therefore require a larger compensatory amount, compared to those with literate head. As for the impact of the gender of head of household, we find that households with female head have larger ES which is consistent with the conjecture that households with male head have a higher average income than those with female head.[2] To have some idea of this discrepancy in incomes, in the absence of reliable data on income of households, we also plot households' total expenditure which turns to be relatively higher for households with male head (their graphs are available on request). This evidence would confirm our conjecture provided that, on average, households' income is proportional to their total expenditure.

One of the most striking features of the evidence examined so far is the marked discrepancy between rural and urban households. Given the importance of this phenomenon for welfare policy, we conclude this section by a closer examination of this discrepancy. First, in Table 6 we show the nonlinear Engel curve estimates separately for rural and urban households of different size.

1. The choice of a male head for the reference household was made on the basis of the evidence that the head figure in the majority of households is male (Calculations are available on request).
2. In addition to their welfare policy implications, these findings also have clear implications for education and income discrimination policies.

Table 6: Food Expenditure Share in Total Expenditure, 1997-2007



Each graph depicted in the above figures shows the non-linear fit for the corresponding scatter-plots of share of expenditure on food against total expenditure.

These graphs clearly show the Engle law holds for both groups hence complementing the evidence in Tables 3 and 4 above, in that: (i) an increase in households' size shifts the Engel curve upwards and to the right; and (ii) there is a clear distinction in the behavior of the Engle curves for rural and urban households. In particular, the difference in the slopes and intercepts of the Engel curves for urban and rural households indicates that a welfare policy that treats all households in the same way - by, for instance, paying identical per capita rebates to compensate for the removal of subsidies - could be biased in favor of one group, albeit inadvertently.[1] To examine this issue further, we have also estimated the general pooled regression equation corresponding to equation (7) discussed above by augmenting it with an

1. We do not claim that the removal of subsidies would benefit any specific group. The main argument is that, because economies of scale exist in households, paying identical per capita rebates would mean that those with larger household sizes would benefit more from these payments in comparison to smaller households.

additional regressor whose coefficient reflects the difference in the slope coefficients for the rural and urban households, namely

$$w_{h,t} \cong \delta + \varepsilon \ln E_{h,t} + o\, RU_{h,t} \ln E_{h,t} + \tau \ln cpi_{h,t} + \varphi S_{h,t} + \mu\, RU_{h,t} + \gamma\, GH_{h,t} + \pi\, LH_{h,t} + u_{h,t} \tag{9}$$

The only extra explanatory variable is the interaction term between the rural/urban dummy $RU_{h,t}$ and the total expenditure variable $\ln E_{h,t}$, whose coefficient λ, captures the difference in the Engel curve slope between the rural and urban households.[1] The coefficient estimates of different equation (9) and its restricted versions are reported in Table 7.

As the results show, λ turns out to be statistically significant in all cases.[2] Thus, the evidence on the statistical significance of the impact of the interaction term between the rural/urban dummy $RU_{h,t}$ and the total expenditure variable $\ln E_{h,t}$, together with the discrepancy between urban and rural ES that we found when both ES indices were calculated on the basis of the same reference household (urban with size = 4), suggest that the formulation of robust welfare policies require a more careful investigation of how the responsiveness of the share of expenditure on food to variations in total expenditure is affected by the urban/rural divide factor. On the whole, our evidence seems to suggest that robust analysis might require the use of two different slope coefficients, for urban and rural households when constructing the ES index, in which case the so-called income-independence property of the ES ought to be relaxed (see the general theoretical discussion above). This would, in turn, imply that instead of simply nominating a reference household type one requires to use a reference household income (or expenditure) level, whose choice would involve a detailed analysis of income distribution and determination of poverty thresholds. This, however, goes

1. Note that as before we have added the consumer price index variable ln*cpi* to account for the price adjustment across the years.
2. The small size of ε and negative sign of o in column (I) are likely to be due to the omitted variable bias problem stemming from the exclusion of the socio-demographic variables. For a detailed discussion of this type of problem see, for example, the study by Mustard (2001) on the impact of demographic features on crime.

beyond the scope of this study and is a future research agenda when utilizing the full dataset we have constructed in carrying out the research for this thesis.

Table 7: Estimates of Equation (13) Based on Pooled 1997-2007 Regressions

	(I)	(II)	(III)
$\hat{\varepsilon}$	-.069979 (-17.97)	-.0907891 (19.21)	-.0912283 (20.03)
$\hat{o}$	-.0061317 (22.43)	.0057526 (2.20)	.0059984 (2.33)
$\hat{\tau}$	.0223544 (3.84)	.0521518 (9.56)	.0528112 (10.12)
$\hat{\varphi}$	--	.0180607 (16.95)	.0165162 (15.97)
$\hat{\mu}$	--	-.1809659 (4.14)	-.1822315 (4.22)
$\hat{\gamma}$	--	--	.0439541 (20.46)
$\hat{\pi}$	--	--	-.0144725 (6.61)
δ	1.538121 (27.77)	1.722338 (26.11)	1.703444 (26.69)
R^2	0.3611	0.4105	0.4161
N	288533	288533	288533
F	455.31 D.F.: 3,27	261.80 d. f.: 5,25	--

See notes to Table 2 for general details. *F* in the last row is the table value of F-ratio, corresponding to the restrictions against the general model in column (III), at 5% critical level with degrees of freedom (D.F.).

6. Summary and Conclusions

Despite its vast natural resources of oil, gas and minerals (mining), dealing with the problem of poverty - and inequality - is a serious challenge for policy makers. This challenge becomes increasingly acute as the authorities succumb, inevitably, to pressures to liberalize the economy by implementing free market principles and similar reforms. This is because an unavoidable consequence of these reforms is their undesirable initial impacts which hit vulnerable groups. Despite the fact that it may be argued that extensive welfare programs already exist that target such groups, an examination of the existing schemes reveals that in most cases they are ad hoc and are not formulated on the basis of robust economic principles. Our investigation in this chapter has shown that the Household Survey Data provides valuable information which can be used to construct systematic and robust measures for tackling the welfare questions that arise in the context of redistribution of resources and/or compensation of consumers.

In this paper we have constructed the Engel-curve based equivalence scales indices for food expenditure shares to illustrate the usefulness of this approach as well as to highlight some of intricacies involved. We have argued, as an example of application of this approach, that this approach provides a more efficient and equitable way of compensating the consumers for the impact of the removal of price subsidies for fuel and food-stuff than the current practice of the Subsidy Targeting Project where all citizens receive a given lump-sum cash which is determined in an ad hoc manner. In addition to taking account of economies of scale and the role of households' main characteristics and allowing for factors such that privileges and opportunities to influence the distribution of transfers in general, we have stressed that this approach will enable the authorities to address important issues such as the role of urban/rural divide when compensating households.

We acknowledge that the work in this paper is simply a starting attempt which motivates and informs future research into the formulation of a systematic, efficient and testable welfare program in connection with projects that are designed to compensate Iranian consumers.

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