Reforming Consumption Subsidies in the State of Kuwait: The Case of Electricity and Water

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Abstract

This paper estimates the economic impacts that would result from restructuring the electricity and water subsidy programs in the Kuwait residential sector. The empirical findings show that implementing the new price systems, as proposed in the Kuwait Development Plan for the years 2002/03 – 2005/06, would reduce the annual subsidy on utilities by KD87.2 million; of which, the welfare losses to consumers measured by the reduction in consumer surplus amounts to KD52.1 million, and the benefit to society measured by the reduction in the deadweight loss is KD35.1 million. Although, the welfare losses to consumers from the partial reduction in subsidy rates is found to be small as a percentage of households' income, a target cash payment approach, not exceeding KD52.1 million, may accompany this policy so that consumers would accept and tolerate higher prices. It is believed that adopting the suggested policies combined would rationalize annual consumption of electricity and water in the residential sector by approximately 9% and 7%, respectively, as well as reducing the financial burden of the subsidy by KD35.1 million annually.

إصلاح سياسات الدعم الإستهلاكي في دولة الكويت : الكهرباء والمياه

محمود بوشهري

ملخص

تهدف هذه الورقة إلى تقييم الآثار الاقتصادية الناتجة عن إعادة هيكلة برامج دعم الكهرباء والمياه في القطاع العائلي بدولة الكويت. أوضحت النتائج أن تطبيق نظم الأسعار الجديدة، كما هو مقترح في خطة التنمية الخمسية، سوف يؤدي إلى خفض الدعم السنوي بمقدار 87.2 مليون دينار ، والذي ينقسم إلى جزئيين؛ خسارة في رفاهية المستهلك مقاسة بمقدار الخفض في ما يعرف بفائض المستهلك والمقدر بـ 52.1 مليون دينار ، ومنفعة للمجتمع مقاسه بمقدار الخفض في الدعم غير المستفاد منه (الهدر) والمقدر بـ 35.1 مليون. وعلى الرغم من أن الخسارة في رفاهية المستهلكين الناتجة عن الخفض الجزئي للدعم كنسبة من الدخل وجدت محدودة، فإنه يفضل أن يصاحب هذه السياسة في المدى القصير دعم مالي مباشر بمقدار لا يتعدى 52.1 مليون حتى يقبل المستهلكون طواعيةً الزيادة المقترحة في الأسعار. سوف تكون المحصلة النهائية وإذا ما طبقت هذه السياسات مجتمعة فإن المحصلة النهائية سوف تكون ترشيداً في إجمالي استهلاك الكهرباء والمياه في القطاع العائلي بما يقارب 9% و 7% ، على التوالي ، وسوف تقود إلى وفر مالي بمقدار 35.1 مليون دينار سنويا.

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Introduction

Over the past three decades, the average annual growth rates of electricity and water consumption in the State of Kuwait are in the order of 8.7% and 9.1%, respectively. The average annual growth rates of nominal and real prices, for both electricity and water, are 0% and -3.1%, respectively.(1) Empirically, electricity and water consumption has been growing at a pace higher than the population growth rate and that of the economy as a whole.(2) Factors that contribute positively to this pattern of increased consumption include: (a) subsidized prices of electricity and water; (b) high standard of living (income) and change in life style with more and bigger residential houses thereby having more intensive use of electrical and water appliances; (c) expansion of economic sectors; and (d) overall absence of electricity and water regulation that promote conservation.

Currently, electricity and water prices are too low and they do not adequately reflect the true cost of providing these services to users. For example, in the year 2003/04, the cost of supplying electricity and water to the residential sector was 18.68 fils per kWh and KD3.463 per 1000 imperial gallons (IG), respectively. Consumers were charged a flat rate of 2 fils/kWh and KD0.800 per 1000 IG. Thus, per unit subsidy on electricity and water was around 89% and 77% of the total cost, respectively.(3)

In addition, in 2003, total electricity and water consumption in the country was in the order of 33,089 million kWh and 94,987 million IG. On the average, the residential sector alone consumed 20,225 million kWh (61.1%) and 66,262 million IG (69.8%). Therefore, total government spending on electricity and water subsidy programs amounted to KD 820 million of which the share of the residential sector was KD514 million (62.6%). This may suggest that any proposed price policy changes aimed to reduce electricity and water consumption and subsidy in the country should consider the residential sector as a potential target.(4)

Clearly, there is a major role for demand side management programs in Kuwait. The government, through new energy and water legislation, is seeking to introduce new price systems for electricity and water in the residential sector, as proposed in the Kuwait Development Plan for the years 2002/03 – 2005/06, to promote efficiency of use of these valuable resources as well as to reduce the financial burden of electricity and water subsidy programs.(5)

A major concern of policymakers is the possible negative impacts of price increases on households' standard of living and their purchasing power, especially those in low/limited income groups. This political concern directly imposes the importance of a complete and comprehensive evaluation of the likely economic impacts of any proposed tariff reforms before its implementation so as to create more transparency when addressing the public on the issue of price changes.

There are two main objectives of this paper: (a) To measure the social welfare gains to the society and welfare losses to consumers resulting from partial reduction in electricity and water subsidy rates in Kuwait residential sector and (b) To provide the decision makers with a policy option that permit consumers to accept higher prices for electricity and water voluntarily.

Theoretical Framework

The empirical literature on the demand for public utilities (i.e. electricity and water) and welfare implications of policy change is voluminous. There exists a large number of studies that deal with both electricity and water demands and welfare implication under different price rates (see for example Narayan and Smyth, 2005; Kamerschen and Porter, 2004; Filippini and Pachauri, 2004 for application on electricity demand; Garcia and Reynaud, 2004; Reiss and White, 2002; and Renwick and Green, 2000 for application on water demand).

Ideally, an empirical model of residential demand for public utilities based on microeconomic theory, should represent quantity consumed of electricity or water as a function of own price, prices of substitutes and complements, and per capita income. Specifically, the demand equation may take the following form:

$$\text{Log } q_t = \alpha + \pi \text{ Log } x_t + \sum_{k=1}^{n} \varepsilon_k \text{ Log } P_{k,t} \qquad (1)$$

where Log q_t is the natural logarithmic of per capita residential electricity or water consumption (kWh per capita or IG per capita), Log x_t is the natural logarithmic of per capita income, Log $q_{k,t}$ ($k = 1,2,..,n$) is the natural logarithmic of an n-vector of prices of substitutes and complements, π is the expenditure elasticity of demand, ε_k is the cross price elasticity of demand for the k^{th} price, and t is the given time period.(6)

For estimation purposes however, researchers usually set most of the cross-price elasticities equal to zero, reducing Equation 1 to a specific number of close substitutes and complements. Certainly, this approach is not appropriate because price elasticities contain both income and substitution effects. While the latter may well be zero for unrelated goods, there is good reason to suppose the former to be nonzero.(7) To overcome this drawback, one may substitute the Slutsky equation [$\varepsilon_k = \varepsilon_j - \pi_k w_j$ (j = 1,2,..,n)]; where is the compensated cross-price elasticity relating to movements along the Hicksian demand curve, and W_j is the budget share] into Equation 1 and obtain demand in terms of real expenditure. That is.

$$\text{Log } q_t = \alpha + \pi \text{ Log}\left(\frac{X_t}{\overline{P}}\right) + \sum_{k=1}^{n} \overline{\varepsilon}_k \text{ Log } P_{k,} \tag{2}$$

where $\overline{P}$ is a general index of prices (i.e. Stone general price index) and $\overline{\varepsilon}_k$ is the compensated cross price elasticity of the k^{th} price. In addition, if homogeneity is imposed and redefine α as

$$\alpha = \alpha^* + \sum_{i=1}^{r} \varphi_i A_i + \sum_{j=1}^{s} \theta_j \text{ Log } q_{j,t-j} \tag{3}$$

where A is a vector of demand shifters that may include average family size, average size of dwelling units, temperature; and $\sum_{j=1}^{s} \theta_j \text{ Log } q_{j,t-j}$ is a distributed lag of quantities consumed in natural logarithmic form that capture the dynamic aspects of the consumer behavior (Halvorsen and Larsen, 2001), then Equation 2 may be written as:

$$\text{Log } q_t = \alpha^* + \sum_{i=1}^{r} \varphi_i A_i + \sum_{j=1}^{s} \theta_j \text{ Log } q_{j,t-j} + \pi \text{ Log}\left(\frac{X_t}{\overline{P}}\right) + \sum_{k=1}^{n_1} \overline{\varepsilon}_k \text{ Log}\left(\frac{P_{k,t}}{\overline{P}}\right) \tag{4}$$

The range of summation in Equation 4 is now restricted to the set of n_1 commodities that are considered to be close substitutes and complements since it is perfectly acceptable to ignore the influence of the unrelated goods ($n - n_1$).(8) It may be noted that, in many cases, data limitation or the type of commodity of interest may restrict the estimation of Equation 4. As an example, for water commodity substitute and complement commodities may simply do not exist and thus, the vector of prices in Equation 4 will be reduced to include only the own price of water (P_t). That is, the demand equation for water may be written as

$$\text{Log}\,q_t = \alpha^* + \sum_{i=1}^{r} \varphi_i A_i + \sum_{j=1}^{s} \theta_j \,\text{Log}\,q_{j,t-j} + \pi\,\text{Log}\left(\frac{x_t}{\overline{P}}\right) + \overline{\varepsilon}\,\text{Log}\left(\frac{P_t}{\overline{P}}\right) \qquad (5)$$

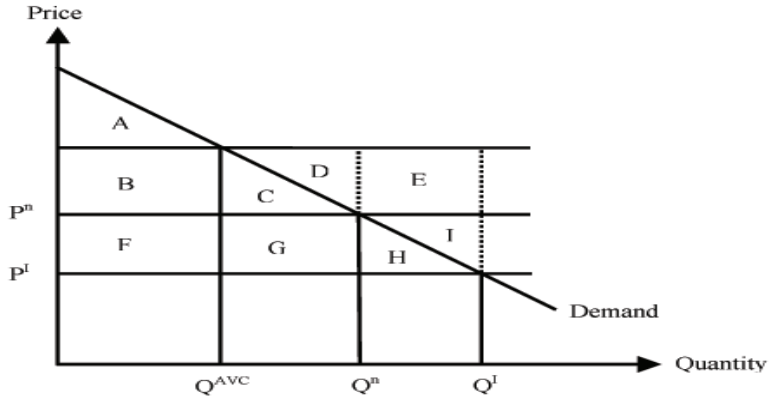
During the last few years, attempts have been made to study the demand for electricity and water in Kuwait, most notably: Al-Enezi et al. (2004); Mukhopadhyay et al. (2000); and Burney et al. (1999). Based on single equation models, a simplified version of Equation 4, these studies have estimated ranges of own price and expenditure elasticities. The own price elasticity for electricity and water are found to be in the range of [–0.05 to –0.30] and [–0.10 to –1.104], respectively.

For the purpose of this study, it is assumed that the own price elasticities for electricity and water are –0.10 and –0.15, respectively. It may be noted that the assumed values are the most conservative estimates borrowed from the above studies on the residential demand for electricity and water in Kuwait.

Welfare Impacts of Price Change

Theories of welfare measurements and their empirical applications are well established (Creedy, 1998; Kim, 1997; Chipman and Moore, 1980). To evaluate the welfare effects of price increase on electricity and water, the study adopts a partial equilibrium approach and relies on price elasticity estimates and the equilibrium conditions2rate.

To elaborate on the above, and aside from the distinction as to whether the demand curve is for electricity or water, suppose that the government increases the prices of water, say, by 10%. The welfare implications of this policy shift are shown in Figure 1. As may be seen in the figure, the initial price, initial quantity, per unit average cost, and the corresponding quantity demanded at this per unit average cost are given by P^I, Q^I, P^{AVC}, and Q^{AVC}, respectively.



In the absence of price change, the government subsidy (GS); the consumer welfare (CW) measured by the consumer surplus,[9]; and the deadweight losses (DL), the inefficiency cost associated with over-consumption, are given respectively, by the following equations and areas

$$GS^0 = [P^{AVC} - P^I] \times Q^I = B + C + D + E + F + G + H + I \tag{6}$$

$$\begin{aligned} CW^0 &= A + [P^{AVC} - P^I] \times [Q^{AVC} + (0.5) \times (Q^I - Q^{AVC})] \\ &= A + B + C + F + G + H \end{aligned} \tag{7}$$

$$DL^0 = GS^0 - (CW^0 - A) = D + E + I \tag{8}$$

If authorities now increase the price of water, then the new price and quantity are given by P^n and Q^n. Under this new situation, the government subsidy; the consumer welfare; and the deadweight losses are given, respectively, by

$$GS^1 = [P^{AVC} - P^n] \times Q^n = B + C + D \tag{9}$$

$$\begin{aligned} CW^1 &= A + [P^{AVC} - P^n] \times [Q^{AVC} + (0.5) \times (Q^n - Q^{AVC})] \\ &= A + B + C \end{aligned} \tag{10}$$

$$DL^1 = GS^1 - (CW^1 - A) = D \tag{11}$$

The welfare implications associated with this policy change are:

Reduction in subsidy: $GS^0 - GS^1 = F + G + H + I + E$ (12)

Reduction in consumer welfare: $UW^0 - UW^1 = F + G + H$ (13)

Reduction in deadweight loss: $DL^0 - DL^1 = I + E$ (14)

The reduction in subsidy therefore, consists of two parts: (a) reduction in consumer welfare which is considered to be a loss to recipients but not to the society, i.e. transfer from consumers to the government; and (b) reduction in deadweight loss which is considered to be a net gain to the society.

Having all the information required to estimate the welfare effects, the new quantity after the price change is given by:

$$Q^n = Q^I + \Delta Q = Q^I \times \left[1 + \left(\varepsilon \times \frac{\Delta P}{P^I}\right)\right] \tag{15}$$

where $\Delta Q = Q^n - Q^I$; ε is the price elasticity ; and $\Delta P = P^n - P^I$.

The reduction in government subsidy (i.e. the area F + G + H + I + E) may be approximated by:

$$RGS = (P^n - P^I) \times Q^I + (P^{AVC} - P^n) \times (Q^I - Q^n) \tag{16}$$

The reduction in consumers welfare (i.e. the area F + G + H) may be calculated as:

$$RCW = \Delta\overline{P} \times \left[Q^n - 0.5 \times \left(\varepsilon \times \frac{Q^I}{P^I}\right) \times \Delta\overline{P}\right] \tag{17}$$

where $\Delta\overline{P} = P^I \times \left[\left(\frac{1}{\varepsilon}\right) \times \left(\frac{\Delta Q}{Q^I}\right)\right]$

The reduction in deadweight losses (i.e. the area I + E) is estimated as

$$RDL = RGS - RCW \quad (18)$$

Empirical Results

The data used in this analysis are obtained from the 1999/2000 Household Income and Expenditure Survey (HIES), the most recent family budget survey conducted by the Ministry of Planning in the State of Kuwait. The HIES includes 2,884 families of which 1,488 are nationals. In the survey, both national and expatriate households are classified according to their monthly expenditure on goods and services that include: food, beverages and tobacco; clothing and footwear; rent, fuel, electricity, and water; household appliances and services; medical expenses; transport and communications; education and recreation.

To assess the impact of increasing the prices of electricity and water on the household sector, families covered in HIES are grouped according to their nationality (nationals vs. expatriates) and their income (low, middle, and upper). For both nationals and expatriates, the household groups are defined as the low 40%, middle 40%, and upper 20% on the income scale.[10]

Table 1 illustrates patterns of electricity and water consumption, as well as, the distribution of subsidy across households under the current price policy (i.e., a flat rate of 2 fils/kWh and 800 fils/1000 IG). The main findings corresponding to national and expatriate households may be summarized as follows:

For nationals, the average monthly income for a representative household in the low, middle, and upper income groups was KD1,073, KD1,882, and KD3,900, respectively. Households, in the low, middle and upper income groups allocated KD7, KD15, and KD45 for electricity consumption and KD16, KD28, and KD39 for water consumption, respectively. As such, national households allocated a small percentage of their income for utilities consumption (i.e. electricity and water), approximately 2%.[11] For expatriates, the average monthly income for a representative household was KD334, KD631, and KD1,268, respectively; of which, household in the low, middle and upper income groups allocated KD2, KD5, and KD9 for electricity consumption and KD4, KD5, and KD8 for water consumption. Hence, expatriate households allocated a smaller percentage, less than 2%, of their income for utilities compared to nationals.

Furthermore, using the 2003/04 subsidy rates, the average monthly subsidy on utilities a representative national in the low, middle, and upper income groups enjoyed, was KD112, KD218, and KD505 respectively; of which, the share of electricity was KD58 (52%), KD125 (57%), and KD375 (74%).[12] For expatriates, the average monthly subsidy on utilities a representative household in the low, middle and upper groups received, was KD30, KD58, and KD102, respectively; of which, the share of electricity was KD17 (56%), KD42 (72%), and KD75 (74%).

Table (1) Distribution of Electricity and Water Consumption and Subsidies

Households Indicators	National Households				Expatriates Households			
	Low 40%	Middle 40%	Upper 20%	Sample Average	Low 40%	Middle 40%	Upper 20%	Sample Average
Average Family Monthly Income (KD)	1,073	1,882	3,900	1,965	334	631	1,268	671
Average Family Size	7	9	11	8	4	5	6	5
Electricity								
A Representative Household								
Average Monthly Expenditure (KD)	7	15	45	18	2	5	9	5
Average Monthly Consumption (kWh)	3,500	7,500	22,500	9,000	1,000	2,500	4,500	2,500
Average Monthly Subsidy (KD)	58.4	125.1	375.3	150.1	16.7	41.7	75.1	41.7
Population				Total				Total
Annual Consumption (million kWh)	1,932	4,140	6,210	12,282	1,381	3,453	3,108	7,943
Annual Subsidy (million KD)	32.2	69.1	103.6	204.9	23.0	57.6	51.8	132.5
Water								
A Representative Household								
Average Monthly Expenditure (KD)	16	28	39	25	4	5	8	6
Average Monthly Consumption (IG)	20,000	35,000	48,750	31,250	5,000	6,250	10,000	7,500
Average Monthly Subsidy (KD)	53.3	93.2	129.8	83.2	13.3	16.6	26.6	20.0
Population				Total				Total
Annual Consumption (million IG)	11,040	19,320	13,455	43,815	6,907	8,634	6,907	22,447
Annual Subsidy (million KD)	29.4	51.4	35.8	116.7	18.4	23.0	18.4	59.8
Utilities (Electricity and Water)								
Average Household Monthly Expenditure (KD)	23	43	84	43	6	10	17	11
Ratio of Utilities Expenditure to Income (%)	2.1	2.3	2.2	2.2	1.8	1.6	1.3	1.6
Average Household Monthly Subsidy (KD)	111.6	218.3	505.1	233.3	30.0	58.3	101.7	61.7
Population Total Annual Subsidy (million KD)	61.6	120.5	139.4	321.5	41.4	80.6	70.2	192.3

Sources:

Ministry of Planning. 2003. Household Income and Expenditure Survey (1999/2000).
Ministry of Planning. 2005. Annual Statistical Abstract.

Ministry of Energy. 2005. Electricity and Water Statistical Year Book.

In addition, according to the Ministry of Planning publications, in the year 2003, there were approximately 115,000 national households and 287,785 expatriate households of two or more members. Assuming the sample in HIES was random and representative of the Kuwait population, then total annual subsidy on utilities for nationals and expatriates amounted to KD322 million, and KD192 million, respectively. Of the total subsidy on utilities (i.e. KD 514 million) the share of electricity was found to be KD337 million (65.7%).[13]

As far as the distribution of subsidy is concerned, results showed that of the total subsidy on utilities enjoyed by nationals, the shares of the low, middle and upper income groups were 19.2%, 37.6%, and 43.2%, respectively. For expatriates, the shares were 21%, 42%, and 37%, respectively. Clearly, both distributions indicate that subsidy is not distributed equitably across households.

Economic Impacts of the Proposed New Prices

Having discussed the pattern of electricity and water consumption in the residential sector, the focus now shifts to the estimation of the welfare impacts of new price systems of electricity and water. The new prices are progressive schedules whereby large consumers pay higher prices. This represents a major shift from the current policy of charging a flat rate for all types of consumers. Table 2 presents the progressive schedule.

Table (2) Proposed New Prices for Electricity and Water

Consumption Brackets	Suggested Prices
Electricity (kWh/month)	Fils per kWh
[0 - 6000]	2
[6001 - 9000]	6
[9001 - 12000]	8
More than 12000	10
Water (IG/month)	KD per 1000 IG
[1 - 8000]	0.800
[8001 - 12000]	1.250
More than 12000	1.500

Source: Ministry of Planning. 2002. Kuwait Development Plan.

As illustrated in Table 1, national households in the low income group and expatriate households at all income levels have monthly consumption of electricity below 6000 kWh/month. Under the new prices, these families will continue to pay 2 fils/kWh for electricity consumed and therefore, would not bear any additional financial burden or reduction in subsidy they receive. The new prices of electricity would affect only national families in the middle and upper income levels.

For water, on the other hand, national families of all income levels and expatriate households in the upper income group would face a water price increase since their monthly consumption of water is above 8000 IG/month.

As mentioned before, the own price elasticities for electricity and water applied in this study are -0.10 and -0.15, respectively. This means that a representative household would reduce its consumption of electricity and water by 10% and 15%, respectively, if they are faced with 100% price increase.(14) However, these price elasticities are assumed to remain constant (i.e. the same) regardless of household income level or nationality.

Table 3 shows the financial impacts of applying the new prices of electricity and water. The main findings may be summarized as follows.

The expected price for electricity a middle and upper income national family would face is estimated to be 2.80 fils/kWh and 7.1 fils/kWh, respectively. This represents an increase of 40% and 255% in the current price of electricity.(15) Therefore, middle and upper income household consumption is predicted to fall by 4% (from 7,500 kWh/month to 7,200 kWh/month) and 25.5% (from 22,500 kWh/month to 16,763 kWh/month).

Given the new rationalized consumption levels and new prices, a middle and upper income family would allocate KD19 and KD102 per month for electricity consumption. Compared with the current situation, this represents an increase of 27% and 127%, respectively. In addition, the subsidy enjoyed by national household in the middle and upper income groups would fall by 9% and 48%, respectively. Generally speaking, applying the new prices for electricity would reduce annual consumption by 1,749 million kWh and annual subsidy by KD56 million.

The expected prices of water per 1000 IG a low, middle, and upper income national family would face, are estimated to be KD1.17, KD1.311, and KD1.365, respectively. This represents an increase of 46.25%, 63.88%, and 70.63% in the current price of water. Therefore, lower, middle, and upper income household consumption of water is expected to fall by 7%, 9.6%, and 10.6%, respectively.

Given the new rationalized consumption levels and new prices, a low, middle, and upper income family would allocate KD21, KD41, and KD59 per month for water consumption. Compared with the current situation, this represents an increase of 31%, 46%, and 51%, respectively. Hence, the subsidy enjoyed by national household in the low, middle, and upper income groups would fall by 20%, 27%, and 30%, respectively.

Furthermore, for expatriates, an upper income household would face 11% price increase and therefore, monthly water consumption and subsidy are expected to fall by 1.7% and 5%, respectively. In brief, applying the new prices for water would reduce annual water consumption by 4,171 million IG and annual subsidy by KD31 million.

Table (3) Estimation of Economic Impacts for Changing the Prices of Electricity and Water

Households Indicators	National Households				Expatriates Households			
	Low 40%	Middle 40%	Upper 20%	Total 100%	Lowest 40%	Middle 40%	Upper 20%	Total 100%
Electricity								
A Representative Household								
Expected New Price (Fils)	2.00	2.80	7.10	-	2.00	2.00	2.00	-
Average Monthly Consumption (kWh)	3,500	7,200	16,763	-	1,000	2,500	4,500	-
Average Monthly Expenditure (KD)	7	19	102	-	2	5	9	-
Average Monthly Subsidy (KD)	58.4	114.3	194.1	-	16.7	41.7	75.1	-
Population								
Reduction in Consumption (million kWh)	0	166	1,583	1,749	0	0	0	0
Reduction in Subsidy (million KD)	0	5.9	50.0	55.9	0	0	0	0
Water								
A Representative Household								
Expected New Price (KD)	1.170	1.311	1.365	-	0.800	0.800	0.890	-
Average Monthly Consumption (IG)	18,600	31,640	43,583	-	5,000	6,250	9,830	-
Average Monthly Expenditure (KD)	21	41	59	-	4	5	9	-
Average Monthly Subsidy (KD)	42.6	68.1	91.4	-	13.3	16.6	25.3	-
Population								
Reduction in Consumption (million IG)	773	1,855	1,426	4,054	0	0	117	117
Reduction in Subsidy (million KD)	5.9	13.9	10.6	30.3	0	0	0.9	0.9
Utilities (Electricity and Water)								
Ratio of Utilities Expenditure to Income (%)	2.6	3.2	4.1	-	1.8	1.6	1.4	-
Population Total Reduction in Subsidy (million KD)	5.9	19.8	60.6	86.3	0	0	0.9	0.9

Source: Computed by the author.

Table 4 shows the welfare implications that would result from implementing the new price systems. As may be seen, the annual reduction in government subsidies on utilities amount to KD87.2 million (17% of total subsidy on utilities enjoyed by the residential sector); of which, the welfare loss to consumers measured by the reduction in total consumer surplus is approximately KD52 million (59.8%). The reduction in the deadweight loss that measures the inefficiency of the subsidy systems is KD35 million (40.2%). The latter result may be generalized even further to say that the welfare loss to the society for every additional 1 KD spent on subsidizing electricity and water is about 40%, holding subsidy rates and demand conditions constant. This percentage is considered to be high by any economic standard.

In general, consumers' welfare losses are small. For example, the welfare losses for nationals in the low, middle and upper income groups are KD4 million, KD12.6 million, and KD34.8 million, respectively. This represents only 0.67%, 1.2%, and 3.2% of the group total income, respectively, implying that the welfare attained after the reduction in subsidy is equivalent to 6.7 fils, 12.1 fils, and 32 fils loss per 1 KD spent on all commodities.

Table (4) The Estimated Welfare Implications of Price Change on Electricity and Water

Households	Reduction In Government Subsidy [RGS]		Reduction In Consumer Welfare [RCW]		Reduction In Deadweight Loss [RDL]	
	Value (million KD)	% of Total	Value (million KD)	% of Total	Value (million KD)	% of Total
Electricity						
Nationals						
Middle 40%	5.9	6.8	3.2	6.2	2.7	7.7
Upper 20%	50.0	57.4	27.6	53.0	22.4	63.8
Water						
Nationals						
Low 40%	5.9	6.7	4.0	7.6	1.9	5.4
Middle 40%	13.9	15.9	9.4	18.1	4.4	12.7
Upper 20%	10.6	12.2	7.2	13.8	3.4	9.7
Expatriates						
Upper 20%	0.9	1.1	0.6	1.2	0.3	0.9
Total	87.2	100.0	52.1	100.0	35.1	100.0

Source: Computed by the author.

As indicated above, the annual net benefit to the society from adopting the new price systems, measured by the reduction in the deadweight loss, amounts to KD35 million. Of this amount, nationals in the low, middle and upper income

groups are responsible for KD1.9 million (5.4%), KD7.1 million (20.2%), and KD 25.8 million (73.5%), respectively. Thus, households in the upper income group would be the main contributors to the reduction in society deadweight loss if the new price systems are adopted. Because of their high consumption levels, the previous proposition would hold even if households in other income groups (i.e. low and middle) face the same price increase as the upper income group.

Implications of the Policy Reforms

As far as policy reforms is concerned, if the government wishes to reduce the burden of the subsidy systems and if a choice is made between the two alternatives of either increasing the prices of electricity or increasing the prices of water, then the former would be the more appropriate policy choice. This is further supported by the fact that increasing the prices of electricity accounts for 64% and 72% of total reduction in subsidy and deadweight loss, respectively.

In the short run, the government may adopt cash payments plan to target groups so as to soften the loss in consumer welfare due to higher prices. Under this policy, the maximum amount the government should pay back, must not exceed KD52.1 million. This plan would allow consumers to enjoy the same level of satisfaction as before the prices increase but without any welfare losses to the society.

Last, but not the least, Figure 2 highlights the impacts of the new prices of utilities on the equity of subsidy distribution, the proportion of subsidy enjoyed by different groups of national households under the current situation and the new price policy.[16]

As may be seen in the figure, under the new prices, the degree of inequality is reduced. The low, middle and upper income households would receive 24%, 43% and 33%, respectively. This demonstrates clearly that the application of the proposed new price systems for electricity and water, would improve the equality of subsidy distribution across national households.

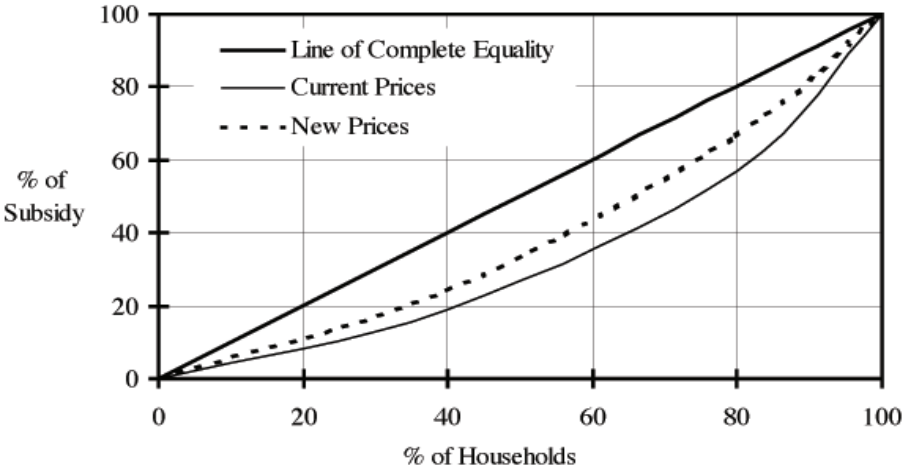


Figure 2. Lorenz Curve: Utilities Subsidy (nationals)

Conclusion

The paper examines the direct economic impacts that would result from increasing the prices of electricity and water in Kuwait residential sector, as proposed in the Kuwait Development Plan for the years 2002/03 – 2005/06. The analysis shows that implementing the new prices for electricity and water would reduce annual consumption of electricity and water by 1,749 million kWh and 4,171 million IG, and subsequently reducing the annual government subsidy by KD87.2 million. Results also show that the reduction in consumers' welfare measured by the reduction in consumers' surplus amounts to KD52.1 million and that the net gain for the society measured by the reduction in deadweight loss is KD35.1 million.

Estimates of the consumers' welfare losses are found to be small in both absolute and relative terms. As an example, the total welfare loss for nationals in the upper income group – the highest welfare loss estimate – amounts to KD 25.8 million. This welfare loss however, as a percentage of the group total income equals to 3.2%, indicating that the welfare attained after reduction in subsidy is equivalent to 32 fils loss per 1 KD spent on all commodities.

In conclusion, this study sugges m ts that the government should implement the proposed new prices for electricity and water in the Kuwait

residential sector. This would reduce the annual consumption of electricity and water by approximately 9% and 7%, respectively. The new price will also reduce the inefficiency of the subsidy systems by KD35 million annually, caused by more than the efficient amount of resources being devoted to electricity and water production to meet the excess demand. A target cash payment plan not exceeding KD52.1 million may accompany the price changes policy in the short run so that consumers would accept higher prices voluntarily.

Footnotes

(1) Nominal price refers to the actual price paid by users. Real price means the nominal prices deflated by the consumer price index. It should be noted that during the last more than three decades, the nominal prices of electricity and water have been set by the Ministry of Energy and have not changed ever since.

(2) From 1995 to 2003, the average annual growth rates of population and the economy (measured by the gross domestic product) were approximately 3.5% and 6.5%, respectively.

(3) Subsidy on electricity and water is defined as difference between cost of supplying these services and price paid by users (consumers) which varies according to sector and location.

(4) Although other sectors are heavily subsidized with no evidence indicating the efficient use of electricity and water, the Kuwait Five Year Development Plan does not propose any price change on electricity or water for these sectors. Therefore, this study will focus only on the likely impacts of increasing the prices of electricity and water on the residential sector.

(5) The government of Kuwait recently led a water conservation campaign to address the water crisis the country had faced, and the importance to rationalize consumption. Although this campaign has achieved some success, it is believed that it would not do so in the future because consumers in general have short memory. Once users assume that the crisis is over, they would return to their normal consumption habits.

(6) Elasticity is defined as the relative change in the consumption of a commodity for an infinitesimal relative change in the expenditure or prices.

(7) See Deaton and Muellbauer (1980) for details.

(8) An alternative to Equation 4 is to use a system of demand equations that recognizes explicitly the interdependency between groups of commodities (Barten, 1993).

(9) Consumer surplus is defined as the satisfaction received by consumers for paying a lower price for a commodity than that price they are willing to pay. This is measured by the area under the demand curve and above the original price of the commodity.

(10) The current analysis follows the approach of Prais and Houthakker (1955) that considers the household as one unit.

(11) The average monthly expenditure of a representative household within a group is estimated by dividing total group expenditure by the total number of families in that group.

(12) The average monthly consumption is obtained by dividing the monthly expenditure by the actual price paid.

(13) The total amount of subsidy on utilities is estimated as the sum of subsidy on electricity and water received by all beneficiaries according to their income levels.

(14) Mathematically, this relationship, holding other variable constant, is given by:

$$\%\Delta Q = \varepsilon \times \%\Delta P$$

where $\%\Delta Q$, $\%\Delta P$ are the relative changes in quantity and price, and ε is the price elasticity.

(15) Note that, the amount of price increase family would face depends on family actual consumption level and the suggested price for each consumption bracket. As an example, the expected expenditure on electricity for a middle income national household is estimated to be KD21 [6,000 kWh × 2 fils + 1,500 kWh × 6 fils]. The new price for electricity which equals to 2.8 fils/kWh is obtained by dividing total expenditure over total consumption (KD21/7,500). This represents 40% increase on the current price of electricity $\{[(2.8 – 2)/2] \times 100\}$.

(16) Figure 2 is known as Lorenz curves. The horizontal axis measures percentages of households receiving subsidy from the low to the upper income groups. The vertical axis measures the percentage of subsidy received by household groups. If the subsidy were distributed equitably, the curve would be a straight 45^o line, implying that households receive subsidy in proportion, i.e., same to their proportion in population. It must be noted that the further the curve is away from the 45^o line, the more inequitable the distribution is.

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