Simulating impacts of reducing subsidies to Kuwait's electricity sector

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Kuwait's electricity is among the cheapest in the world, and it is the most highly subsidized sector in the country. Indeed, it is so highly subsidized that the sector generates electricity and almost distributes it to users for free. The extremely generous subsidy is intended to serve as a means of allocating welfare transfers to resident businesses and households. The government owns a vertically integrated monopoly – managing the entire supply chain from electricity generation to retail.

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In recent years, however, it has become increasingly clear that this welfare-oriented electricity production and distribution has had adverse economy-wide effects, specifically conflicting with other policy priorities such as environmental protection and appropriate resource allocation. There is growing awareness among policy makers and researchers that the existing policy is not sustainable. The necessity for economic reforms in wider areas of public utilities management is rooted in recent shifts in economic development strategies, as well as in initiatives related to regional integration among GCC member countries.

Given mixed results from public utility reforms in many countries, uncertainties surrounding the effects of regulating the Kuwaiti electricity sector have caused some apprehension among the public. This article will shed some light on the likely impacts of the envisaged reform and summarizes some of our main conclusions from a forthcoming study, whose objective is to quantify economy-wide impacts of public utility reform that may start by targeting the reduction of electricity subsidies. The study is based on a computable general equilibrium (CGE) model which simulates the possible economy-wide impacts of reducing electricity subsidies.

Electricity tariffs and consumption

All GCC member countries are known for charging extremely low electricity tariffs compared to the rest of the world. Generally, electricity tariffs range from between 2.2 US cents/kWh in Qatar to an average (with a range of differentiated tariff bands for different types of users) of around 4.1 US cents/kWh in Saudi Arabia. By contrast, most electricity users in Kuwait pay a nominal tariff of 2 fils (about 0.7 US cents/kWh, about a third even of Qatar's low electricity prices), which means that Kuwait has the lowest electricity tariff of the GCC member countries. Kuwait's 2 fils/kWh rate was introduced in 1966 and has been retained, with some modification, at that level. The cost of generating electricity, on the other hand, has risen sharply over the years. Between 2000 and 2010 alone the cost of production per kWh doubled from 20 fils (7 US cents)/kWh to about 40 fils (14 US cents), suggesting a subsidization rate for Kuwait's electricity of 95 per cent in 2010.

These extremely generous subsidies have given rise to a pattern of unsustainable behaviour in electricity use, which is reflected in a number of key aggregate indicators. In terms of its economic use of electricity, not only does Kuwait's efficiency (measured in terms of GDP generated per kWh used) stand among the lowest in the world but the situation has been worsening over the years. In 1990, the GDP/kWh ratio was US$1.4 but this fell to US$1.2 in 2005. This contrasts poorly with experience across most other parts of the world, including emerging economies. Kuwait's per capita electricity consumption is now amongst the highest in the world, more than doubling between 1985 and 2005, at which point Kuwait ranked second only to Norway. However, unlike the case of Norway, whose electricity needs are primarily met by renewable (mostly hydro) sources, Kuwait's electricity is generated entirely using fossil fuels.

Prospects for reform

Pressure to reduce electricity sector subsidies in Kuwait comes from various sources. One is Kuwait's latest medium-term development plan, which expressed the government's commitment to implement far-reaching liberalization of the country's economy. This plan is expected to be implemented through two firmly interrelated strategies: (a) diversifying the structure of the economy by reducing the dominance of the oil sector and encouraging the growth of non-oil sectors; and (b) promoting private sector development and reducing the dominance of the public sector. Liberalization of public utilities including electricity and water are prime targets in achieving these goals.

There is also regional pressure, related to the processes of interconnecting the GCC electricity grid. The primary goal of this initiative is to provide power supply stability and reliability by integrating the high voltage transmission systems of all GCC member countries. The economic rationale for this lies in the need to improve competitiveness in generation and distribution capacity, which each country badly needs in in the medium to long term. This interconnection of transmission systems encourages countries to engage in trading electricity with each other, on the basis of each country's comparative marginal costs. Cross-border electrical energy trading started in summer 2010, although information on quantities traded has not yet been made available.

The relevance of the GCC electricity grid connection to reform and regulation in each country lies in the pressure felt by each country to improve its efficiency, in order that its marginal cost of production and distribution would be competitive relative to that of its neighbours. In this regard, Kuwait is already at a relative disadvantage, since its marginal cost is relatively high compared to other GCC member countries. For instance, Qatar's marginal cost of electricity production at peak is less than half that of Kuwait ($88/MWh and $188/MWh respectively). These differences are largely explained by types of fuels (mostly natural gas in Qatar and heavy oil in Kuwait) together with the types of turbines used to fire electricity generating plants.

The model

The model used for this study was adapted from the International Food Policy Research Institute's (IFPRI) standard CGE model. A social accounting matrix (SAM) was constructed for Kuwait with 2010 as its base year. The 2010 Kuwait input–output table, and related system of national accounts obtained from the Central Statistical Bureau (CSB), provided the core data required to construct a SAM with 17 production sectors. This was supplemented with other satellite accounts such as employment, demographic, and capital stock, which are separately estimated in line with flow variables in the SAM.

The model was implemented using a comparative static framework. This simply implies instantaneous movement of the economy from the current status to another without tracing the path through which the economy passes during the adjustment period, which would require a fully dynamic model. The long-run outcomes of both a fully dynamic model and the comparative static long-run model are about the same, since each involves full adjustment of the economy to the shock caused by the policy change.

The focus of this study, while designing the simulation experiments, was on labour market conditions in order that the highly segmented nature of the labour market in Kuwait could be captured. Expatriates constitute the bulk (about 83 per cent) of Kuwait's workforce, with Kuwaitis accounting for the remaining proportion. Critically, the national labour force is highly concentrated in the public sector, which includes the electricity sector. The average wage level for Kuwaitis is substantially higher than that of expatriate salaries and wages, which is highly relevant in the context of this study. Economic reform in Kuwait is bound to be implemented in conditions of inflexible wages and limited sectoral mobility among Kuwaitis. However, labour market conditions for expatriates are likely to be characterized by flexible wages and free mobility between sectors. The simulation experiments were conducted taking these conditions into account.

Results

The model was used to conduct three simulation experiments. The first run replicated the base year situation –the baseline scenario – which represents the status quo. The second and third runs each imposed a policy shock under different conditions. These yielded results which were different from the base run. The differences between the base scenario and the policy shocks highlighted the effects of the policy change.

A 25 per cent reduction in electricity subsidy was applied and the economy-wide impact of this change was evaluated. This rate of subsidy reduction was chosen arbitrarily, it can be set at a lower or higher rate. However, it is not feasible to implement much larger shocks – such as abolishing electricity subsidy altogether – in a CGE modelling context, particularly when the rate of subsidy in the baseline scenario is as high as 95 per cent. In such cases, policy shocks can be evaluated by applying relatively small changes to get a sense of magnitude regarding impacts.

For this policy experiment, the 25 per cent subsidy reduction was simulated in two scenarios. Scenario 1 was run without compensating households for any welfare loss resulting from rises in electricity prices due to the partial withdrawal of subsidy. Scenario 2 simulates the case where the government compensates households by an amount relative to the size of the increased government budget surplus (induced by the partial withdrawal of subsidy). The two scenarios are separately discussed below.

Scenario 1: Subsidy reduction without compensation

We begin with intra-sectoral impacts. Gross value added in the electricity sector fell by 34 per cent while the electricity tariff rose by 260 per cent (this means a rise from 2.0 to 5.2 fils/kWh). The policy shock revealed interesting macroeconomic and sectoral impacts. The inter-sectoral effects were more or less in inverse proportion to sectoral electricity use intensity – the more intensive users experienced relatively larger contractions, while the less intensive electricity users experienced some expansion. The variety of impacts at sectoral level led to negligible macroeconomic effects: aggregate GDP (value added measure) declined by less than 1 per cent; government surplus increased by about 3 per cent, as we had expected; and household welfare, measured in terms of equivalent variation, declined but only by 0.5 per cent. In this modelling framework, the net impacts of this policy shock were negligible but the distributional impacts were probably significant. We have shown this in terms of distributional effects across sectors, but distributional effects by households groups are beyond the scope of this analysis, since this study is based on a highly aggregated SAM which does not distinguish between households by income or expenditure sizes. This is left for future research.

Scenario 2: Subsidy reduction with compensation

In this scenario households were compensated for the welfare loss they experienced due to the policy change. It should be noted that the reduction in welfare reported above is negligible. However, if the subsidy reduction was much larger, say 50 per cent or more, then we would expect that the welfare loss to households would be much larger as well. The policy shock would increase the government budget surplus. However, unlike other countries with large budget deficits, current economic reforms in Kuwait are motivated more by the need to adjust the structure of the economy and to improve efficient resource allocation than by budgetary considerations. In that context, if economic reform can help with achieving the objectives of improving the efficiency of resource allocation, then compensating households for welfare loss may be necessary, particularly if public resistance to expected reform of public utilities, including the electricity sector, is to be reduced. It was with this policy context in mind that scenario 2 policy experiment was conducted.

The additional simulation shock was effected by compensating households by the full amount of budget surplus gained by the government as a result of the policy change. In other words, government transfer to households was scaled up by the full amount of the difference between government budget surplus resulting from the policy shock in scenario 1 and the corresponding figure in the base year. This yielded a much higher expansionary effect. In scenario 2, the only sector experiencing contraction in terms of gross value added was the electricity sector, the sector that received the shock, but it only contracted by about 32 per cent which was smaller than the contraction it experienced in scenario 1. The rates of positive stimulus to the other sectors ranged from 0.41 per cent in government services to 6 per cent in the construction sector. Aggregate GDP increased by 2.2 per cent and the compensation caused household welfare to improve by 3.4 per cent compared to the baseline level. The positive impacts resulted from the stimulus created by the reform, in terms of resource allocation and expansion of economic activities.

Conclusion

The simulation experiments indicate that subsidy reduction does not necessarily cause any substantial contraction in economic activities or decline in household welfare. The differences between the two policy scenarios indicated that the adverse demand-side effect of the subsidy reform dominates. Specifically, when households were compensated for the welfare loss, then this made the effects of the policy reform positive and hence aggregate GDP and household welfare effects also became positive.

However, the results of the simulation experiments reported in this study should be interpreted with caution. First, the model used for this analysis is highly aggregated, and hence it does not account for distributional effects, particularly for differential impacts on households in different income brackets. Second, a comparative static framework gives the long-run effects of the policy change but it does not explicitly show the length of time it will take to reach the long-term outcome.

'… SUBSIDY REDUCTION DOES NOT NECESSARILY CAUSE ANY SUBSTANTIAL CONTRACTION IN ECONOMIC ACTIVITIES …'

Policy reforms, such as a reduction of subsidy to Kuwait's electricity sector, can realize positive and desired results if accompanying measures are implemented in addition to the actual change to the policy instruments. The accompanying measures may include organizational or technological changes, both of which imply innovations which are not quantifiable in a modelling framework. This means depending on whether or not these innovations accompany the policy change; the results reported in this study can overestimate or underestimate the effects of reducing subsidy. Similarly, the applications of packages of reform measures can influence the speed with which the economy will realize potential benefits from reducing or abolishing subsidies to public utilities.

For instance, the 32 per cent contraction in the electricity sector was likely to overstate the adverse effects since the reform package would not be confined to just reducing or removing the subsidy but would also involve partial or full privatization of the public utility. This in turn would lead to substantial efficiency gains through organizational changes and introduction of the latest technology in the process of electricity generation. If this is the case, then the economy-wide positive stimulus of the reform could be much greater, or the adverse effects much smaller, than the reported simulation results.

Ayele Gelan's study 'Quantifying economy-wide impacts reducing subsidy to the electricity sector' is forthcoming and is to be presented at the International Conference on Economic Modelling, 201, Bali, Indonesia, 16–18 July 2014.