The British Privatization of Electricity Network Industry

The effect of the Electricity reform on domestic electricity prices in the United Kingdom

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The UK Electricity Industry Reform
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Introduction

The aim of this paper is to highlight the impact of privatization of the Electricity Industry on householder’s prices in the United Kingdom. To this purpose, it could be useful to start with brief economical background information.

The United Kingdom

The UK’s economy comprehends those of its home nations: England, Scotland, Wales and Northern Ireland. As a member of the EU, the UK is part of a single market that ensures the free movement of people, goods, services, and capital within member states. The UK, however, still maintains its own national currency: the Pound Sterling. With 64.1 million inhabitants the Kingdom is the third most populated country of the EU. 53 million of its inhabitants live in England, and with 383 people resident per square kilometer the region has one of highest density in the world.

According with the International Monetary Fund, presently, the UK is the sixth world largest economy measured by nominal GDP. Despite its varying pattern of cyclical ups and downs, the British economy has, on average, grown at 2.5% per year for six decades, with minimal breaks in trend: the decade from 1973. The population has grown over 10 million in the last 50 years, so a better indicator of living standards is obtained from the ratio of real GDP to population. The GDP pro capita trend upwards over the period, too, although the annual average growth figures over our sub-periods are not as rigid as the aggregate data: 2.2% for 1962-80, peaking at 2.3% in 1980-2000. Then slip back slightly to 2.1% in the last decade. Currently the GDP per head is 34.6 thousand Euro pro capita, sharply over the European average.

Over the past 50 years the structure of the economy has been transformed. Manufacturing now contributes only around 12% of total output and represent only the 16% of the labor force. In the 60s the 27.2 % of the labor force was employed in manufacturing. Nowadays the service activities dominate the economy in terms of both output and employment.

1 B. Allen, E. Baroudy, R. Batley, B. Paulson and P. Sinclair, Growth in Britain, Department of Economics, University of Birmingham, Edgbaston, Birmingham, 2007
The Electricity Industry

1. History of the industry

1.1 Pre-privatization history

The history of the electricity industry dates back to 1881 when the first public electricity suppliers were established in Godalming and Brighton, where small hydro-plants were used to generate electricity for street lighting. After a slight expansion of the electricity industry the number of electricity suppliers increased sharply. The industry, therefore, was very fragmented and there were many companies, both private and public (over 480 municipalities in 1921), who were supplying electricity at different voltages and frequencies. In 1926, the Electricity Act established the Central Electricity Board with the intent to create a national high-voltage grid with standardized frequencies and to oversee the construction of new generation capacity. However, the CEB failed to provide a proper national framework; consequently, the electricity was provided at different voltage. In 1943, electricity supply in the north of Scotland was placed under the North of Scotland Hydro-Electric Board (the Hydro-Electric Board), a public corporation established to develop the water power resources of the Highlands.

In England and Wales the nationalization took place in 1947. Under the Electricity Act brought the distribution and supply activities of the private and municipal companies under state control. The British Electricity Authority (BEA) became responsible for the generation of electricity and its bulk transmission to the 16 Area Electricity Boards (12 in England, 2 in Wales and 2 in Scotland). The AEBs were in charge of the distribution, the billing and other customer services. In Northern Ireland the nationalization of the electricity industry took place in 1951 and the 73 electricity supply companies were combined into three public companies which were unified into the Northern Ireland Electricity Supply (NIES) in 1973. The NIES became responsible for the generation, the transmission and the distribution of the electricity in Northern Ireland. The Electricity Reorganization Act 1954 established the independent south of Scotland Electricity Board (SSEB) who took over the British Electricity Authority’s functions in the two Scottish Area Boards. The Hydro-Electric Board and the SSEB were responsible for the generation, the transmission and the distribution of electricity in Scotland. The electricity Act of 1957 introduced the Central Electricity Generating Board (CEGB) and the Electricity Council who replaced the BEA in England and Wales. The CEGB produced the vast majority of the electricity generated and owned the transmission system while The Electricity Council exercised a coordinating role on matters of industry-wide concern. Under the act, the Area Boards were accorded greater autonomy and continued to have responsibility for the distribution and retail of electricity in their respective areas.

3 Chessire, J., UK Electricity Supply under Public Ownership, in Surrey, J., The British Electricity Experiment – Privatization: The Record, the Issues, the Lessons, Earthscan: London. 2006
4 Ibidem
1.2 The reform

A number of factors contributed to the decision to restructure the electric power sector in the 1980s. The Thatcher government disdained public ownership on both ideological and pragmatic grounds. The electric power sector was performing poorly, with productivity lagging the all-manufacturing average. Plant cost overruns were very large and the CEGB was planning yet more construction. In early 1988, the Government published a White Paper entitled "Privatizing Electricity," detailing the planned restructuring of the sector. With minor modification, the report constituted the core of the Electricity Act, which received Royal Assent in July 1989. The electricity industry was restructured before the privatization occurred in order to avoid criticism of previous sell-offs. In fact it was widely argued that other privatization simply transformed public monopolies into a private one rather than introducing competitive markets.5

This view is also supported by the World Bank which stated in its 2004 report on infrastructure reform: “...for privatization to generate widely shared social benefits, infrastructure industries must be thoroughly restructured and able to sustain competition. Thus restructuring to introduce competition should be done before privatisation, and regulation should be in place to assure potential buyers of both competitive and monopoly elements”.6

The new structure was introduced on March 1990. Ironically, that coincided with the resignation of Margaret Thatcher. The Reform involved several different changes: vertical disintegration of generation, transmission and distribution; horizontal deconcentration of the power generation stage; a power pool to coordinate transactions between generators and customers and an independent regulator.

The CEGB was split into 3 generating companies and a transmission company. The fossil-fuelled power stations were divided between National Power and PowerGen, The nuclear power stations were transferred to Nuclear Electric and the transmission system was transferred to the National Grid Company(NGC). The NGC also took control of the interconnectors with Scotland and France. In addition, the 12 Area Boards were replaced by 12 Regional Electricity Companies (RECs), and each REC had the duty to supply on request all demands for electricity in its area. The NGC was jointly owned by the RECs in proportion to their size. In Scotland, the SSEB and the Hydro-Electric Board were replaced by Scottish Power and Scottish Hydro-Electric and the vertical integration was maintained. In two years the generating companies and the RECs in England and Wales and the two vertical integrated Scottish companies were sold, the Northern Ireland supply industry followed in 1993. In 1996 the nuclear part of the industry was floated on the stock market as British Energy. One year before, the National Grid Company floated on the Stock Exchange. After the

“Grate Divestiture”, almost the entire industry was in private hands. However, the British government retained golden shares in the privatized companies. This meant that investors could acquire significant shareholdings in electricity companies but would not be able to gain a controlling interest.

After privatization the RECs could supply electricity outside their initial authorized area over other distributions networks for a regulated access charge. The change to the way in which generation was priced was the most radical and most important element of the reforms; the Electricity Pool was created in 1990 to balance electricity supply and demand in the wholesale market. The National Grid Company (NGC) ran the ‘Electricity Pool’. The Electricity Pool provided for wholesale physical trading of electricity between generators and purchasers. Generators had to sell electricity to the Pool and wholesale customers, including suppliers, had to purchase electricity from the Pool. In 2001, the Power Pool was replaced by the New Electricity Trading Arrangements (NETA). One of the main characteristics of NETA is that, in contrast with the former pool, generators now self-dispatch and if their generation does not match their contractual output they are subject to imbalance prices.

From April 2005 under the British Electricity Trading and Transmission Arrangements (BETTA), introduced in the Energy Act 2004, the electricity systems of England and Wales and Scotland were finally integrated.

Despite the government efforts to avoid criticism, the reform of the electricity industry, as well as other privatisations, raised a wave of public disquiet because it was argued that the electricity assets have been sold at less than the fair market value which allowed large margins of profits. This issue was used by the Labour Party as part of its political programme for election prior to 1997, leading to the implementation of a windfall tax on what were claimed to be the excess profits of the privatised utilities in order to redress the balance between shareholder and taxpayer benefits.
2. Industry structure

Electricity is an indispensable part of our life. A reliable and efficient electricity industry is crucial for economic development and competitiveness. The electricity sector is a network industry comprising distinct but inter-related activities, namely Generation, Transmission, Distribution and Retail activities. Electricity is a technically homogeneous and non-storable product and system reliability requires that supply and demand are matched simultaneously. Generation involves production and conversion of electric power. Transmission implicates long distance transportation of electricity at high voltage. Distribution consists of transportation of low voltage electricity through local networks and consists of overhead lines, cables, switchgear, transformers, control systems and meters to transfer electricity from the transmission system to the customers. The supply function consists of metering, billing, and sale of electricity to customers. Transmission and distribution are natural monopoly. The characteristics of the industry, especially the coordination between four sectors, favor the vertical integration. The electricity reforms have generally regarded the generation and supply activities as potentially competitive while the transmission and distribution networks are natural monopoly activities that need to be regulated.

2.1 Generation

Electricity cannot be economically stored; it must be used the instant it is generated – supply and demand must match at all times in order to avoid blackouts. This explains the need for spare capacity (about 12 to 30% of total capacity) resulting in extra costs for electricity suppliers.
Electricity generation in Britain has changed considerably since 1990. These changes alter the economics and the environmental impact of electricity use. Notably, coal has fallen sharply as an input into power generation (see graph below). Oil has declined even more rapidly in the electricity generating mix.

The share of electricity coming from nuclear power has decreased slightly. The gas input has grown sharply, mainly as a result of the ‘dash for gas’ in the 1990s.

The Dash for Gas was the 1990s shift by the newly privatized electric companies in the United Kingdom towards generation of electricity using natural gas. The key reason for this shift were: the high interest rates of the time, which favored gas turbine power stations, which were quick to build, over coal and nuclear power stations, which were larger but slower to build; the decline in wholesale gas prices; the desire by the regional electricity companies to diversify their sources of electricity supply and establish a foothold in the profitable generation market. There were also technical: advances in electricity generation technology with higher relative efficiencies and lower capital costs.

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Fifty-two companies now own power stations across the UK although many of these are small with relatively low capacity. The 10 biggest generating companies, as is showed in the table below, own about 80% of the total UK capacity.
Table 1: Main electricity generating companies

<table>
<thead>
<tr>
<th>Company</th>
<th>Percentage of UK total Capacity (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>British Energy</td>
<td>15</td>
</tr>
<tr>
<td>Npower (Germany)</td>
<td>13</td>
</tr>
<tr>
<td>Powergen (Germany)</td>
<td>12</td>
</tr>
<tr>
<td>Scottish&amp;Southern</td>
<td>10</td>
</tr>
<tr>
<td>ScottishPower</td>
<td>8</td>
</tr>
<tr>
<td>EDF Energy (France)</td>
<td>6</td>
</tr>
<tr>
<td>Drax</td>
<td>5</td>
</tr>
<tr>
<td>Centrica</td>
<td>4</td>
</tr>
<tr>
<td>International Power</td>
<td>4</td>
</tr>
<tr>
<td>BNFL</td>
<td>3</td>
</tr>
</tbody>
</table>

Source: OFGEM

2.2 Transmission

The transmission is owned and maintained by regional transmission companies, while the system as a whole is operated by a single System Operator by National Grid Electricity Transmission plc (NGET) - it is responsible for ensuring the stable and secure operation of the whole transmission system. As seen before, the transmission is a natural monopoly and need to be regulated. This role is played by the OFGEM. Three Transmission Operators, currently, are permitted to develop, operate and maintain a high voltage system within their own distinct onshore transmission areas: National Grid Electricity Transmission plc (NGET) for England and Wales, Scottish Power Transmission Limited for southern Scotland and Scottish Hydro Electric Transmission plc for northern Scotland and the Scottish islands groups.\(^8\)

2.3 Distribution

The electricity distribution networks are regional grids that branch from the national grids to deliver power to industrial, commercial and domestic users. There are 14 licensed distribution network operators (DNOs), owned by six different groups, and each is responsible for a regional distribution services area. In addition there are also a number of smaller networks owned and operated by Independent Network Operators. Since the DNOs are natural monopolies they are regulated by OFGEM.

\(^8\) Ofgem
The UK Electricity Industry Reform

2.4 Retail Market

In 1999 full competition was introduced into Britain’s electricity retail market. Since then domestic and non-domestic consumers have been able to shop around for their electricity supplier. Suppliers buy energy from the wholesale market or directly from generators and arrange for it to be delivered to the end consumer. They set the prices that consumers pay for the electricity that they use. Every year, the Ofgem publish a Supply Market Indicator (SMI), which estimates the components that make the retail market prices. The indicators comprehends wholesale prices, distribution and transmission costs and supply operating costs.

3. Regulation

Between 1948 and 1990 the energy sector was under public control. Government set the general operating rules and the parliament had the responsibility to monitoring the electricity industry and check in which extent it was meeting the rules and requirements set by the government. The post-war priorities were to expand capacity to meet the growing demand and extend the electricity grid to reach all communities, therefore there was a central investment planning and the price regulation was based on the “cost-plus” formula.

After privatization but before the full competition on domestic markets was achieved, the regulator set price controls fixing maximum price on supply and gradually decreased the elements of price regulation just for

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9 Opcit, found in https://www.ofgem.gov.uk/electricity/retail-market/gb-electricity-retail-market
10 Pond, R, Liberalisation, privatisation and regulation in the UK electricity sector, Working Lives Research Institute, London Metropolitan University, November 2006
low income consumers. However, it was impossible to introduce competition in the national transmission and regional distribution networks; because of the structural characteristics of the industry they remained natural monopolies. The transmission charges are known as Transmission Network Use of System charges (TNUoS), are intended to recover the costs of building, maintaining and running the transmission system by the Transmission Owner from users of the transmission system. In line with other prior privatization, The TNUoS tariffs are regulated by an RPI-X revenue cap. This means that the NGC and the RECs could only increase their prices in line with the retail price index less an amount t X set by the regulator. “X” was set based on the rate of return on investments so the purpose of this formula was to encourage companies to improve their efficiency and cut their costs.

During the late 1990s several mergers took place in the energy sector: a sharply number of companies were supplying both electricity and gas and this led to the provision on the Utility Act of 2000 that unified the gas and the electricity regulators into the Ofgem. Ofgem’s main responsibilities are to protect consumers and to promote competition and regulate the monopoly companies. It is an independent authority, recognized by EU Directives, and it is funded by the energy companies who are licensed to run the electricity and gas networks.

Following the completion of market opening in 1999, Ofgem concluded that competition in supply was enough established for all classes of consumer and, consequently, the remaining very limited elements of price regulation for certain classes of consumers was no longer necessary.

11 Ofgem is the Office of Gas and Electricity Markets.
The domestic prices trend

To explain the impact of electricity industry reform on prices, we have to consider the demand, the supply and the reform.

1. The demand

Firstly, we will analyze the demand. The demand is driven by householders’ need for electricity services, such as light, comfort and entertainment. Nevertheless, it comes as no surprise that energy use in homes is strongly affected by both the population and the number of households. The population rose from 55.6 million in 1970 to 62.2 million in 2011, with an average 0.28% growth per years. However, the number of households grew more rapidly over the period, from 19 million in 1971 to 26 million in 2011. The rising number of households reflects a trend for smaller households, with more people living alone and in small families. Without improving the energy-efficiency of homes, or the ways people use energy at home, growth in household numbers and smaller average household size would lead to higher per capita energy demand.

A second variable that influence the demand of domestic electricity is GDP. According to the World Bank, between the 1990 and 2006, the British economy grew, on average, at 2.68%. The dramatic financial crises reduced the average annual growth of the last two decades to 2.08%. In 2009 the GDP declined sharply with a decrease of 4.31%. The growth of the GDP would lead to electricity consumption, however the empirical
data shows that is true only until 2005. After 2005 the energy consumption decreased from 125.711 GW/h to 113.453 GW/h in 2013.

In fact, the growth rate of consumption is below the GDP growth. The difference between the two growth rates could also be caused by the increasing energy efficiency of houses (see graphic below).
3. The supply

After analyzing some components of the demand we consider some variables which influence the supply of electricity.

The fuels used to generate power changed considerably because of the privatization and the cutting emissions regulation. Under nationalization, electricity companies had to use relatively more expensive domestic fuels such as coal, while after privatization generation of electricity using natural gas increased because the gas turbine power stations were quick to build and the gas price was lower. Another reason of the decrease of use of Coal was its high emissions of CO2. These changes altered the economics and the environmental impact of electricity use.

Prices of fuels used to generate powers have a great impact on the final retail prices.

![Average prices of fuels purchased by the major UK power producers](source:DECC)

Figure 7 Average Fuel input prices

As we can observe in the graph above, the price of the coal used to generate electricity decreased during the 90s by more than 36% and the gas price registered a reduction of nearly 15%. After 2000, the prices had a dramatic increase, especially the gas price which is nearly three times more than 2000 price.

Retail prices do not reflect immediately fuel prices changes because the cost of old contracts at higher prices are passed on to consumers.\(^\text{12}\)

4. The reform

In the first part of this paper we have focused on the history of the reform. However, for an empirical analyzes of the prices it is useful to use the OECD grade in Energy, Transport and Communication Regulation (ETCR). The OECD grade use a band 0-6, where 6 means that the country is very far from achieving the result of fully open and free market economy. The ETCR aggregate is make of: entry, public ownership, vertical integration and Market structure. The graphic below shows that the Electricity Industry has been fully privatized since 2002. The free competition has been created since 1999. However, the Vertical integration grade did not decreased as entry and public ownership, since a complete unbundling of electricity industry is impossible in network energy industry.

![OECD regulation grade](image)

Figure 8 ETCR grades

On the other hands the graphic below shows the aggregate grade of the industry.

![Reform of electricity industry](image)

Figure 9 Reform of Electricity Industry
5. The prices
Between 1985 and 1990, before privatization, the prices levelled. Since 1990, for two years, the prices increased sharply researching 0.75p/kWh in 1992. Hence, the prices fell steadily, reaching the lowest price of the decades in 2004. Since 2004, excluding the year after the crises, the prices has grown sharply.

4.1 The price trend

![Figure 10 Electricity prices(p/kWh)](source: EUROSTAT)

![Figure 11 Electricity Prices (PPS)](source: EUROSTAT)
By considering only the empirical data from 1992 to 2004, the consumers to seems to benefit from privatization with a significant decrease of prices. However, considering the long term data, this correlation disappeared.

![Correlation ETCR and Prices](image1)

**Figure 12 ETCR and Prices**

In the long period the domestic consumption of electricity has been stable, levelled about to 100000 GWh.

![Electricity consumption](image2)

**Figure 13 Electricity consumption**

However, the retail prices for households consumer increased.
In order to explain trend of the domestic electricity prices it is essential to consider the prices of fuels used in the generation of electricity.

The graphic below suggests that electricity retail prices are highly correlated to both, natural gas and coal, input fuel prices.

![Electricity domestic retail price and fuel prices indices (2010=100)](image)

According with Ofgem “Costs fell from the late 1990s until 2004, when the UK first imported more gas than produced itself. Since then, Britain has had to attract gas imports from around Europe and further afield. This has meant that gas prices in Britain have become increasingly influenced by global events.”

**Conclusion**

Privatization policies may induce a important change in country economy. In this paper we tried to understand the effect of privatization of electricity industry on prices. Summing up, we started with the history of the electricity industry. Then, we tried to outlook the peculiarities of the electric sector. Finally we focused on the empirical data. Our conclusions are that the privatization has not significantly influenced the prices trend; in fact it seems that the prices are largely result of exogenous factors, namely coal and natural gas prices.
**Biography**

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DECC (Department of Energy and Climate Change) data find on http://www.ons.gov.uk/ons/index.html

Eurostat, data find on http://ec.europa.eu/eurostat/data/database


OECD, data find on http://stats.oecd.org/Index.aspx?DataSetCode=ETCR

Ofgem, data find on https://www.ofgem.gov.uk/

ONS data find on http://www.ons.gov.uk/ons/index.html