Trends in the European electricity markets: the case of Greece

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Abstract: Over the last decades, the structure of the European Union (EU) electricity sector has witnessed fundamental reform due to the increased complexity in interactions of political, economic and technological forces. The way electricity industry is structured is gradually evolving from vertically integrated state-owned monopolies to unbundled entities that favour free market mechanisms. The scope of this paper is to analyse the main aspects involved in the liberalisation process of the EU electricity industry and determine the progress made in less liberalised countries such as Greece, in terms of competition and regulatory reform. In order to empirically address this issue and inform policy makers, we study in-depth the case of the Greek electricity market by employing the structure-conduct-performance (S-C-P) paradigm.

Keywords: the EU electricity markets; competition; deregulation; policy issues; Structure-Conduct-Performance paradigm; Greece.

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1 Introduction

There is no doubt that the electricity market, with a world net generation of 17,350 billion KWh in 2005 and 150 billion Euros of annual sales, constitutes one of the most important energy markets (EIA, 2008). Electricity is expected to remain the fastest growing form of end-use energy worldwide through 2030, as for the past several decades. To give but an example of the scale of its use, it is worth mentioning that in 2003 only, countries, later forming the European Union 25 (EU-25), consumed 2,605 TWh of electricity energy, representing approximately 19.4% of all final energy consumption in the EU (EC, 2007). The market is also critical for the competitiveness and economic growth of the European Union since it has an impact on all other economic activities (EFILWC, 2008).

Until the mid 1990s, the European electricity market was vertically integrated and state-owned (e.g. Littlechild, 2001; Newbery, 2000). Vertically integrated companies mainly involved the activities of generation, transmission, distribution and supply of electricity to final consumers (i.e. industry and households), serving either exclusively certain regions or even entire member states. In such a centralised regime, prices and tariffs were regulated. Recently, this situation has profoundly changed due to the European-wide market opening introduced first in 1996. As a result of the liberalisation process, the electricity market has been split up into two distinctive segments: a regulated and a competitive one. Transportation of electricity (i.e. transmission and distribution through high or medium and low voltage grids) is still considered as a natural monopoly and thus remains regulated, while generation and supply of electricity have been progressively opened to competition.

The main reasons that have historically favoured the opening of the European electricity market can be attributed to a number of economic and political factors. First of all, it should be stated that the electricity sector by nature plays a strategic role in the economic growth and competitiveness of all EU member states. Moreover, it is well acknowledged that this sector is capital intensive and requires vast investments. Given that the European Commission (EC) needs to monitor the electricity sector closely and intervene with policy recommendations and directives (competition and regulatory), whenever appropriate.

In the last decade, the EU policy makers and interested parties were challenged to reform the electricity market due to inefficiencies identified in its vertically integrated segments (e.g. EC, 2001a, b, 2007, 2008). The low productivity of the industry along with high degree of borrowing by the state-owned energy companies, have gradually led governments to pursue strategies focusing at the opening of the electricity markets. To put it differently, electricity sector reform has often been regarded either as a means to

raise revenue by privatisation (e.g. the case of the Eastern Europe) or as an imperative for upgrading the inflow of foreign direct investments in developed countries (Newbery, 2000). In addition, the two energy crises (1973 and 1979) and the intensiveness of the globalisation process along with the rapid growth of a few multinationals in recent years have led the EU policy makers to initiate strategies towards the enhancement of competition in the electricity industry. Moreover, the growing political disaffection with vertically integrated monopolies and the liberalisation success stories identified in other network industries (telecommunications and gas) also led to growing interest in the electricity sector reform (Meeus et al., 2005).

In order to enhance effective competition in the electricity market, the European Union issued two main directives (96/92/EC and 2003/54/EC). Although the primary goal of these Directives was the promotion of a single European electricity market, in practice, the implementation process varies considerably across member states. A few European countries like the UK, Germany, Norway, Finland and Sweden acted as pioneers in the liberalisation process and pursued strategies focusing at full market opening and the introduction of effective competition in the generation and supply segments. Other countries like Spain, Italy, Belgium, The Netherlands, Denmark and Luxembourg opted for an opening schedule. Countries like Greece, Portugal, Ireland and France are still at the initial restructuring stages since they have opened their electricity markets to meet minimum requirements. It is worth mentioning that the Scandinavian and the British models, which both targeted at separating generation from transmission activities and creating a 'spot market' for wholesale electricity, are rapidly becoming reference models for reform in developed economies (Newbery, 2000).

The aim of his paper is to analyse the main aspects involved in the liberalisation process of the EU electricity industry and determine its current condition in terms of competition and regulatory reform. In order to assess the main trends and characteristics in the restructuring of the European electricity market, an in-depth analysis of the Greek electricity market is performed by employing the two-way causations Structure-Conduct-Performance (S-C-P) paradigm (Clarke, 1985).

Despite its crucial importance, electricity market issues in the less liberalised countries such as Greece have not yet been examined in-depth by policy makers and researchers. In our view, this work which is done for the first time in the relevant literature in such a systemic way provides a useful support to policy makers and regulators in the field of the electricity markets. In contrast to prior fragmented approaches to Greek electricity markets, this paper by exploring a few convenient variables and proxies that run the S-C-P paradigm helps government's officials to understand better the causal links among markets, companies and regulatory measures. Besides, the present investigation of the Greek experience comprises a quite informed and solid reference point to other countries that accordingly pursue strategies of sectoral deregulation, especially in the network utilities (natural gas, water and telecommunications).

The remainder of the paper is organised as follows. Section 2 provides a description of the main trends prevailing in the EU electricity sector focusing at market structure issues and legal evolution, while Section 3 describes the S-C-P theoretical model employed in the research methodology of this paper. Using summary statistics data, in Section 4, the case of the Greek electricity energy industry is investigated with reference to basic elements of the S-C-P model. Along to this analysis, there is a critical discussion over key relationships that may indicate their role to the Greek electricity market's

effective functioning and openness. Finally, Section 5 encapsulates the main findings of our investigation presented together with a few policy propositions.

2 Evolution in the EU electricity sector

2.1 Market characteristics

The EU electricity sector is divided into four main market segments:

1 the generation of electricity

2 the transportation of electricity on high-voltage grids (transmission)

3 the transportation on medium-and low-voltage grids (distribution)

4 the supply of electricity to final customers.

Many companies (e.g. E.ON, Edf, ENI, Edison, EDP and Electrabel) operate across all market segments except transmission and distribution networks, which are monopolised and regulated (EFILWC, 2008).

As Table 1 shows, the degree of market opening in the supply segment of the EU electricity market either increased significantly between 2001 and 2005 or was already a 100% free market by 2001. Big changes were recorded particularly in countries like Spain, France and Italy with full liberalisation achieved in a few cases.

Table 1 Degree of market opening in electricity supply market (%)

Country	*2001*	*2005*
Belgium	35	90
Czech Republic	–	74
Denmark	90	100
Germany	100	100
Estonia	12	95
Greece	30	62
Spain	45	100
France	30	70
Ireland	30	100
Italy	45	79
Cyprus	–	35
Latvia	–	76
Lithuania	–	74
Luxembourg	–	84
Hungary	–	67
Malta	–	0
Netherlands	33	100
Austria	100	100
Poland	–	80

Table 1 Degree of market opening in electricity supply market (%) (continued)

Country	*2001*	*2005*
Portugal	30	100
Slovenia	–	77
Slovakia	–	79
Finland	100	100
Sweden	100	100
UK	100	100

Source: Eurostat (2006, p.6).

In order to assess the level of competition in the supply electricity market, we first examine the percentage of eligible customers that changed supplier and then consider the level of concentration as a proxy that may indicate the level of market power. As shown in Table 2, the large-scale industrial customers have considerably switched their supplier, in contrast to the commercial and residential ones (IOBE, 2005). It is worth mentioning that the latter became eligible only in the last few years and, especially since 2007. The switching in the electricity supplier (i.e. the incumbent company) by the large industrial customers is more evident in countries like the UK, Finland, Sweden and Denmark than in Italy, Luxembourg and Greece. Overall, the high levels of switching supplier in the EU indicate a trend towards an increased level of competition in the electricity supply segment.

Table 2 Electricity supplier's change in the European countries

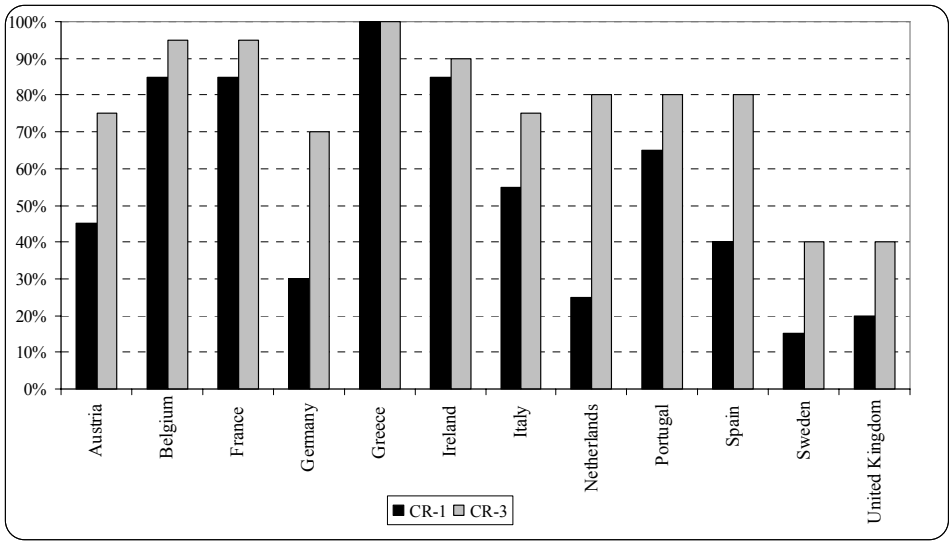
	*Large industrial customers**		*Commercial and residential customers*	
Country	*From market opening (%)*	*During 2003 (%)*	*From market opening (%)*	*During 2003 (%)*
Austria	22	7	3	1
Belgium	35	8	19	19
Denmark	>50	22	5	5
Finland	>50	16	n.a	4
France	22	n.a	–	–
Germany	35	n.a	6	n.a
Greece	0	0	–	–
Ireland	>50	6	1	1
Italy	15	n.a	–	–
Luxembourg	10	n.a	–	–
Netherlands	30	n.a	35	n.a
Portugal	9	7	1	1
Spain	18	5	0	0
Sweden	>50	5	n.a	10
UK	>50	n.a	>50	22

*with consumption that exceeds 1 GWh per year (e.g. cement and steel industry). n.a means not available.

Source: IOBE (2005, p.110).

As both Tables 1 and 2 show, the EC's liberalisation efforts definitely had an impact on the level of competition, although this was differentiated across the various member states. However, as Figure 1 exhibits, market concentration rates still remain significantly high in most of the cases. Countries with a relatively high level of market concentration are Greece (CR-3 index equals to 100%), Ireland, France, and Belgium. Countries like the UK and Sweden tend to be significantly more liberalised since the relevant concentration index (CR-3) does not exceed 40%.

Figure 1 Market shares in the electricity generation segment (CR-1 and CR-3)



Source: Authors' elaboration with data from IOBE (2005).

2.2 Legal framework

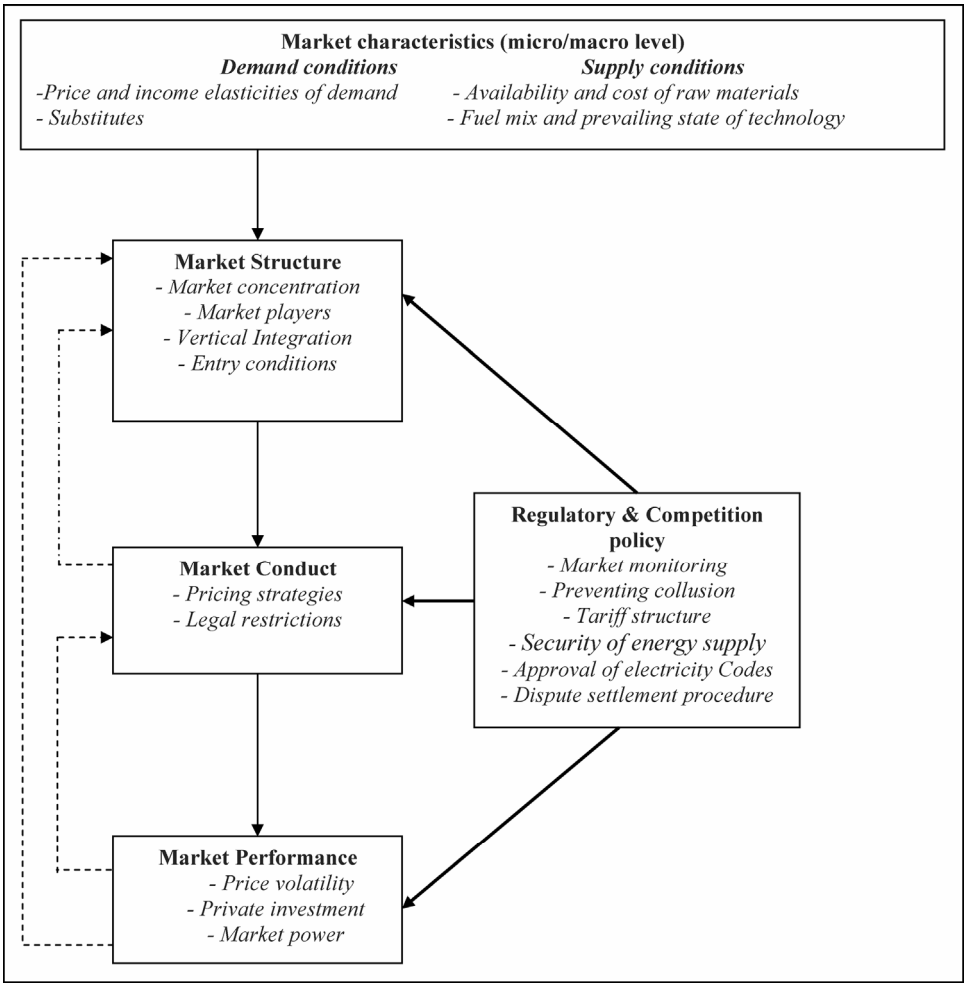
It is worth mentioning that in the mid1990s, the European Union initiated a process for the development of an internal liberalised electricity market in order to attain lower prices and secure the availability of supply. The first European Electricity Directive introduced in 1996 (Council Directive 96/92/EC), has been adopted to encourage cross-border trade and eliminate discriminatory practices by providing common rules for generation and transport of electricity. However, this Directive made no provision for the electricity market organisation. In 2003, the European Commission issued the Directive 2003/54/EC. This new Directive establishes common rules for the generation, transmission, distribution and the supply segments of the electricity market. Most important, this Directive includes legal provisions for unbundling of the transmission and distribution system operators, the protection of the consumer and the establishment of independent national regulatory and supervision bodies for energy.

3 Theoretical model

In order to assess the main aspects of the regulatory reform witnessed in the Greek electricity sector, we followed the well-known S-C-P paradigm of industrial organisation, first introduced by E.S. Mason (1939, 1957) and J.S. Bain (1956, 1968). This model attempts to assess the performance of a given industry and explain the two-way causal links and relationships that exist among key variables that run the S-C-P model. The key concept of this paradigm is that market performance is determined by the conduct (behaviour) of market participants, which in turn, is determined by market structure and vice versa. Although, there are certain limitations to this model (e.g. Fafaliou and Ballas, 2008). In our view, the S-C-P paradigm constitutes a good way to organise data and key variables at industry level. Consequently, it can produce information to the policy makers and regulators in several useful ways (see also Carlton and Perloff, 1989).

On the basis of the theoretical setting of the S-C-P model, it is first attempted to investigate whether the main proxies and structural characteristics of the electricity market (i.e. concentration, number of sellers and buyers, vertical integration and entry and exit conditions) have changed after liberalisation. It is also examined in what way and how the above variables determine the extent and nature of competition in the market and in turn affect the strategies of the market players (conduct). Then it is examined how the behaviour (pricing strategies, legal restrictions and other policy objectives) of the existing firms determines the market's economic performance. In particular, it is attempted to explore whether or not price volatility and excess profits are gained through the exercise of market power. Then, it is assessed whether and how the level of private investment is linked to significant market power. Moreover, the basic conditions of supply and demand in the electricity industry are considered. The supply conditions examined in the Greek electricity sector include the availability and cost of raw materials, the fuel mix (solid fuels, natural gas wind and solar energy, etc) and the prevailing state of technology. Demand conditions examined include the price and income elasticity of demand and the availability of substitutes. Finally, the dominant competition policy and regulatory interventions are described and explored so as to determine the combined links and relationships that exist in the overall S-C-P framework of the Greek electricity sector (Figure 2.)

Figure 2 An outline of the structure-conduct-performance paradigm in the Greek electricity sector



4 The case of the Greek electricity energy sector

4.1 Overview

The legislative and regulatory framework of the Greek electricity sector has been significantly modified over recent years, as authorities sought to comply with the EU *acquis*. The first Law 2773/1999 introduced the primary measures for the liberalisation process (allowing for competition in generation and supply segment to the high-voltage customers) and set up the Regulatory Authority for Energy (RAE), as well as the Hellenic Transmission System Operator (HTSO). The second Law 3175/2003 preludes a wholesale market development through the establishment of a mandatory day-ahead market. It also enlarges the notion of 'suppliers' to include traders (not only generators)

and initiates a balancing mechanism. Under the influence of this Law, competition in the retail supply has been extended since all customers became eligible by 1 July, 2004, except for the households. This Law also introduces a mechanism for tenders on capacity of generation to ensure security of the system (EC, 2007). A further Law 3426/2005 introducing new substantial amendments to the main legal framework was adopted in 2005. According to this Law, as of the 1st of July 2007, all household customers became eligible.

4.2 Demand and supply conditions

Based on the S-C-P approach, in order to determine the level of demand in the electricity market, we consider factors such as price and income elasticities and condition of substitutes. In turn, we explore if and how demand influences the ability of existing firms to set coordinated prices. We then assess supply condition by considering factors such as the availability and cost of raw materials, the fuel mix and the prevailing state of technology. This analysis is expected to give us further evidence on the way existing firms behave.

4.2.1 Demand conditions

Price and income elasticities of demand. As our elaboration reveals, the electricity demand is income elastic and price inelastic in the long-run (Table 3). The relevant low magnitude of price elasticity reflects inter alia, the limited degree of substitutability regarding alternative energy sources (natural gas, oil, wind and solar energy). Various empirical studies identify that the magnitude of own price elasticity ranges from –0.28 to –0.85 (Table 3). In the short run, consumers do not react rapidly to electricity price fluctuations since the relevant price elasticity is lower than its long-run counterpart. According to further evidence, electricity consumption in Greece should be treated as a necessity good and for this reason, price variations should be expected to have a small effect on the level of electricity demand both in the short and in the long-run (e.g. Polemis, 2007a).

On the contrary, as evident from Table 3, electricity demand in Greece is income elastic in the long run and inelastic in short run. In alignment with RAE's projections (RAE, 2003), a more recent work reveals that income elasticity of residential electricity demand in the long-run and short-run is estimated to 1.14 and 0.39, respectively (Polemis, 2007b).

Substitutes. According to our findings from the overview of recent empirical studies, electricity does not have close substitutes (Polemis, 2007b; Rapanos and Polemis, 2005; Hondroyiannis, 2004). However, Rapanos and Polemis (2005) argue that there is some sort of substitutability regarding residential electricity demand. In their assessment of the Greek residential electricity demand for the period 1965–1998, they concluded that cross-price elasticities between fuel oil and electricity are positive and statistically significant, though only in the long run. They also concluded that cross-price effects are small. The latter is in alignment with Polemis (2007b) who argues that the range of energy switching in the residential sector is still very narrow.

Table 3 Income and price elasticities of electricity demand

Study	*Period/Sector*	*Elasticities*		*Econometric Method*
		Income	*Price*	
1 Polemis (2007b)	1970–2003 (household sector)	1.14[a] 0.39[b]	–0.21[a] 0.02[b]	VECM
2 Polemis (2007)	1970–2004 (industrial sector)	– –	–0.85[a] –0.35[b]	VECM
3 Rapanos and Polemis (2005)	1965–1998 (household sector)	1.38[a] 0.36[b]	–0.69[a] –0.17[b]	ECM
4 Hondroyiannis (2004)	1986–1999 (household sector)	1.56[a] 0.20[b]	–0.41[a]	VECM
5 Christodoulakis et al. (2000)	1974–1994	1,74[a]1,12[b]	–0.14[b]	ECM
6 Donatos and Mergos (1991)	1961–1986 (household sector)	1.46[a]	–0.28[a]	OLS

[a] = Long-run elasticities; [b] = Short-run elasticities; OLS = Ordinary least squares; ECM = Error correction model; VECM = Vector error correction model.

Source: Authors' elaboration.

As regards substitutes in the industrial sector, several studies indicate that there is a substitutability relationship between oil (diesel and heavy fuel oil) and electricity (Christopoulos, 2000; Floros and Vlachou, 2005; Polemis, 2007a). In our view, the increasing use of the natural gas in many Greek industrial sectors (due to further liberalisation of the energy market), may trigger a stronger substitution effect across the industrial energy sources in the forthcoming years (see also Polemis, 2007a).

4.2.2 Supply conditions

The availability and cost of raw materials. Up-to-date, the main energy source used to generate electricity in Greece is the indigenous lignite which is extracted from surface mines exclusively by Public Power Corporation (PPC). Due to considerable individual characteristics of the lignite (i.e. high moisture, volatile and low-carbon content), almost all existing lignite-fired plants are constructed to burn only this kind of material. Lignite is a relatively cheap fuel compared to other energy sources, such as coal, natural gas and oil. Greek legal framework encompasses two types of deposits:

1 privately owned deposits which can be exploited freely by their owners

2 public deposits (owned by the Greek government) for which the latter grants exploration and exploitation rights (EC, 2008).

Despite lignite's advantages, it should be noticed that if desirable, the transformation of lignite-fired plants into coal-fired ones would require large-scale investments (EC, 2008). Moreover, lignite is considered unsuitable for transporting over long distances. For this reason, all lignite-fired plants in Greece and elsewhere are located close to lignite mines. It is worth mentioning that there is no exporting activity of lignite across the EU member states and so is the case with Greece (DG-TREN, 2005).

Except for lignite, many power stations in Greece use natural gas as their primary fuel. Natural gas was introduced to the Greek energy system after 1996 (IEA, 2002). Natural gas is imported to the mainland basically from Russia and Algeria (Liquefied Natural Gas) via high-pressure pipelines and ships, respectively. Domestic production represents only a small percentage of total gas supplies (1.5% in 2003) and is expected to decline further (IEA, 2006). Therefore, the availability of natural gas in the Greek market depends on the steady flow from foreign suppliers.

Oil-fired power plants installed in the mainland system are few and very old. They use residual fuel oil and operate mainly for supplying ancillary services and reserve power (RAE, 2007). In the interconnected system, the share of oil to the installed capacity of electricity in 2007 does not exceed 6% (PPC, 2007). However, in the non-interconnected islands (i.e. the so-called autonomous islands that are not connected to the mainland, such as Crete and Rhodes), oil is the most exclusive energy source used for electricity production. Oil-fired power plants cover more than 99% of the total electricity produced in these islands.

Finally, hydroelectric plants are also used to generate electricity so as to cover peak load (Iliadou, 2009). The installed capacity of renewable energy sources (RES) is still very limited, despite the high potential of wind and solar energy. In 2007, RES covered only 5% of the total installed capacity in the interconnected system, while their share in the autonomous islands reached only 2% (PPC, 2007).

Fuel mix and the prevailing state of technology. As discussed above, electricity in Greece can be produced in many ways by using a variety of fuels and applying different technologies. However, as the EC (2007) report indicates, generation technologies that use low-cost fuels (lignite) often require relatively large capital investments, while generation technologies requiring relatively expensive fuels (e.g. gas turbines) have relatively a low-fixed costs.

As Iliadou (2009) identifies electricity generation in Greece is characterised by low-thermal efficiency on average. This is mainly due to the ageing of power plants owned by PPC (i.e. open cycle oil stations and lignite plants). The new gas-fired power plants built over the past few years are based on Combined Cycle Gas Turbine (CCGT) technology and, therefore, display high-thermal efficiency rates. Natural gas burns cleaner than other fossil fuels, such as oil and coal and produces less carbon dioxide per unit energy released. In the last decade, new CCGT units were commissioned and part of the old oil-fired plants of PPC has been transformed to use natural gas. As a result, the share of natural gas in total electricity generation increased significantly from 5.1% in 1999 up to 21% in 2007, while the share of oil-based power generation decreased from 18.8% down to 6% (Iliadou, 2009).

4.3 Industry structure

Greek electricity industry includes four relevant distinct sub-markets (generation of electricity, supply of electricity from wholesalers or importers to final consumers, transmission of electricity through high-voltage grid and distribution of electricity through medium or low-voltage grid). Under the electricity liberalisation law 2773/1999, PPC is the exclusive owner of both the transmission grid (high-voltage grid) and the distribution network (medium-and low-voltage network). Moreover, PPC is the exclusive operator of the distribution network and the network of the non-interconnected islands.

Due to the fact that transmission and distribution market segments are natural monopolies regulated by RAE, our analysis in the following sections of this paper focuses only in generation and supply electricity market segments that gradually opened to competition.

4.3.1 Market concentration

One of the main concerns in our analysis is the increased level of market concentration which may give scope for exercising market power by the incumbent. At the end of 2006, PPC owned 90% of total installed capacity in the interconnected system, while the second 'largest' energy company (Energiaki Thessalonikis S.A., Greece) claimed only 3.6% of the market (EC, 2008). In the supply segment, despite the gradual market opening, only a few eligible customers were partially served by a supplier other than PPC, covering a small part of their load through imports. Therefore, we conclude that the Greek electricity sector is characterised by significant market concentration in the two competitive segments (i.e. generation and supply).

4.3.2 Market players

The market of electricity generation comprises of a vertically integrated company (PPC) and a small number of independent power producers (IPP). Due to inadequacies of the existing legal and regulatory framework, and the resulted high scale of investments required, only two independent power plants (HERON, San Francisco and Energiaki Thessalonikis or ENTHES) have been built up and started to operate (EC, 2007).

We should make clear that before the liberalisation of the electricity supply segment (in 2001) PPC was the only supplier of electricity, apart from a few other individual manufacturers that produced electricity only for self-consumption. Up to 2007, nine supplier companies, holding licences from the Ministry of Development, were selling electricity to PPC, imported via the interconnectors or generated by IPPs to the industrial and commercial customers. However, despite the fact that all customers could switch electricity supplier from 1 July, 2007 nobody has done it so far. Iliadou (2009) argues that this is mainly attributed to the existence of regulated end-users tariffs that PPC is obliged to apply, since these tariffs are often below cost, making new entrance into the supply market ineffective.

4.3.3 Vertical integration

In Greece, there is a vertically integrated company with a dominant position leading to high levels of market concentration. The existence of vertical integration of supply and network (transmission and distribution) reduces the economic incentives for the network operator to facilitate third parties' access in the market and expand the network in the interest of all network users. For this reason, legal unbundling is considered an appropriate strategy for the policy makers to ensure that PPC does not abuse its dominance position (EC, 2007).

4.3.4 Entry conditions

The lack of competition in the Greek electricity industry is also attributed to a number of structural factors that act as obstacles to new entrants (i.e. electricity producers and suppliers). Below, we analyse some of the most significant barriers to entry.

Capital requirements and regulated end-users tariffs. It is a common knowledge that electricity sector is capital intensive. However, although demand of electricity grows fast in Greece (at levels that exceed the increase in GDP), under the current liberalisation scheme, there is a high cost for new entrants in the market (sunk cost). As a result, the IPP may operate with a high-investment risk in a market that lacks effective competition (IOBE, 2005). Up-to-date, low-regulated tariffs set by the Ministry of Development in the supply market, do not fully reflect the long-run marginal costs and for this reason they act as barriers to entry (Iliadou, 2009). Moreover, it is worth mentioning that tariffs have not increased much within the last few years after the liberalisation, in contrast to the wholesale price which has been increased (System Marginal Price or SMP) sharply. The discrepancy between the wholesale price and retail tariffs can give enough economic reasoning for the weak interest of electricity suppliers other than PPC to enter the market.

Exclusivity property rights to the incumbent company. The condition of the markets for fuels which can be used for power generation (i.e. lignite and natural gas) also acts as a barrier to entry. The most-favoured customer clause in the contract between the incumbent and the only importer of gas in Greece Public Gas Corporation, which is still in force, hinders the level of competition (IEA, 2002)[1]. Moreover, the granting and maintaining of privileged rights to PPC, for the exploitation of lignite in Greece, creates inequality of opportunity among the economic operators as regards their accessibility to primary fuels for the production of electricity. As a result of the hindered incentives for entering the Greek wholesale electricity market, the dominant position of PPC is maintained or even reinforced.

Limited interconnection capacity. Greece is the only European country which is geographically isolated from other member states (Spain, Portugal, France, Germany, Belgium, etc). In particular, Greece is located at the periphery of the EU internal electricity market. In order to meet the increasing demand of electricity, Greece has interconnectors to its Northern borders (i.e. Albania, FYROM and Bulgaria) and Italy, through a maximum capacity of 500 MW underwater cable connection. The total capacity of northern interconnectors is 600 MW, so overall, the interconnectors capacity is 1,100MW. This interconnection capacity of the electricity grid is relatively small, and then electricity imports that play a significant role in the integration of the market are limited. This, in turn, does not favour the competition in the electricity market. This condition has serious implications for the further opening of the market and need also to be taken into account by the regulators.

4.4 Industry conduct

4.4.1 Pricing strategies

Currently, PPC's end-users' tariffs are approved by the Ministry of Development after RAE's positive opinion. The current tariff structure does not fully reflect non-refundable cost elements such as CO_2 certificates nor even the purchasing cost of natural gas. This has led to the deterioration of the financial situation of PPC. More specifically, price margins of the incumbent company have shown a significant decrease during the last years, reaching the level of 8–9% (IEA, 2006). Greek law provides that all PPC supply tariffs are regulated and fixed by the Ministry of Development after hearing the opinion of RAE. According to the provisions of the customer supply code, RAE must regulate

tariffs of a supplier that provides more than 70% of the total consumption. This means that the tariffs for the incumbent company will remain regulated until its market share falls bellow 70% of all electricity supplied in Greece. It is worth mentioning that current tariffs are only differentiated by the voltage level (high, medium and low voltage) with some customer groups (i.e. PPC employees and farmers) receiving different prices in the mainland (IEA, 2006).

4.4.2 Legal restrictions

The existing legislation is usually considered as one of the main obstacles that hinder competition in all market segments. The main weaknesses are associated with heavy bureaucracy in the licensing process and the absence of a well-organised wholesale energy market (future electricity markets or power exchanges) which can reduce the financial risk of investors. Furthermore, conflict of interests between governmental entities and the owner of the incumbent company (i.e. the Greek Government) plays a crucial role in the liberalisation of the market (IOBE, 2005). The absence of the liberalisation in the natural gas market also increases uncertainties for the new entrants.

4.5 Industry performance

4.5.1 Price volatility

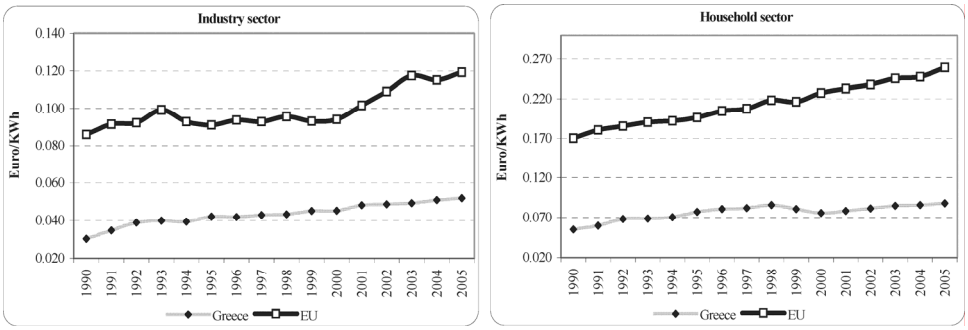
Electricity prices in Greece prior to (1990–2000) and after the liberalisation (2001–2005) of the sector are not characterised as highly volatile (Figure 3)[2]. During the investigated period (1990–2005), industrial electricity prices in Greece have shown a steady increase by 3.7% per annum, while the EU-15 electricity prices have increased by 2.2% annually. In the residential sector, Greek electricity prices have annually increased by 3.2%, while EU-15 prices have shown a modest growth rate resulting in 2.8% per annum. However, industrial and residential prices in Greece have increased to a lesser extent during the liberalised period compared to the regulated one. More specifically, in the industrial sector during the liberalised period (2001–2005) electricity prices have increased by 7.9%, while during the period 1990–2000 (regulated period) the increase was 49.7%. In the residential sector, the prices during the liberalised and the regulated period have increased by 12.2 and 37.6%, respectively.

4.5.2 Private investment

Within the last years, PPC and 11 private entities obtained licences for gas-fired plants. However, only two investment schemes built up power plants to date. These 11 licences to potential competitors to PPC were issued following a call for interest made by RAE in 2001. This call for tenders included only power plants using natural gas, and other technologies were excluded (lignite-fuelled ones).

In addition to the independent private investment scheme, HTSO has adopted a separate tendering procedure aiming at securing reserve capacity. Under this new call, generators are obliged to provide availability of new generating plant capacity at a future point of time, in return for financial compensation. The maximum capacity under these agreements is set at 900 MW with a further increase up to 400 MW (EC, 2008).

Figure 3 Final electricity prices in Greece and EU-15 (1990–2005)



Source: Authors' processed data on energy prices and taxes from various issues of IEA/OECD.

From the above, we conclude that the promotion of new investment in order to ensure adequacy of power supply is a crucial issue for the overall performance of the Greek electricity sector, both in terms of allocative and technical efficiency.

4.5.3 Market power

The high level of SMP in the generation and supply segment of the Greek electricity sector requires close monitoring of the market in order to eliminate potential anti-competitive practices by the incumbent. Exploitative practices (i.e. abuse of dominant position and collusion) deter entry in the market, thus diminishing the level of effective competition. However, within the last few years, some progress has been made in setting the proper framework for the decrease of PPC's dominance, including its exclusion from future tenders on new generating capacity (IEA, 2006). Moreover, unbundling of PPC activities (generation, transmission and distribution/supply), as proposed by the EC Directive 2003/54, is expected to prevent the incumbent supplier from exercising further market power (IEA, 2006).

4.6 Regulatory and competition policy

Regulatory and competition policy in the Greek electricity sector play a crucial role for the further liberalisation of the market. Under this logic, RAE was established in 2000 as an independent administrative authority, with monitoring, controlling and counselling responsibilities. RAE does not act simply as the main advisor to the Greek Ministry of Development, but it has also the authority to ratify electricity codes, set tariffs, settle disputes, secure energy supply in favour of the customers, etc.

Overall, we argue that the Greek regulatory framework influences and supports to a limited extent the liberalisation in the Greek electricity market. Besides, the majority of market reforms in the EU involve establishing independent regulatory bodies to supervise the sector in favour of the consumers' protection (Jamasb et al., 2005). However, as the Greek case proves, regulatory reform per se is neither a panacea nor a safeguard for effective competition practices in the market. An effective regulatory context requires going hand in hand with successful competition policy involving constant market monitoring, anti-monopoly strategies and prevention of collusion.

5 Conclusions and propositions

In this paper, we consider the main trends and characteristics involved in the liberalisation process of the EU electricity industry with emphasis on progress made in the less liberalised countries, such as Greece. Our theoretical approach to the issue shows that over the last years, the electricity sector in most of the EU member countries has undergone significant changes and further progress has been made in terms of the creation of a single European electricity market. However, as our investigation indicates members states have opened their electricity markets to a different extent. Therefore, experience in the introduction of competition in the electricity markets (generation and supply) has been controversial.

Our analysis of the liberalisation experience of the Greek electricity market shows that reform in Greece is still at initial stages and lots have to be done in the future. However, despite the discrepancies observed in the Greek regulatory framework, one by no means can establish the argument that the Greek electricity market performs badly. As it has been demonstrated through the use of the S-C-P model, the Greek electricity market exhibits high concentration rates but this is not a sufficient explanation for arguing that the state-owned incumbent attempts to use its power to abuse the market since electricity tariffs remain at reasonable levels. One might explain the concentration of the market by the nature of the technology used (in the Greek case, the lignite) and the vast investments this technology requires. Furthermore, it could be argued that in cases where fixed costs are more important than variable costs, then the incumbent needs a large share of the market to reduce its average cost. In this respect, authorities should not be seriously concerned about high concentration since prices are of a greater importance. Finally, although it has been showed that effective competition in Greek electricity market is far away from other EU countries, this does not exclude at least the possibility of potential competition, given the on-going attempts for regulatory reforms in the country.

Due to the high importance of the electricity markets to the industrial prosperity of a country and the convenient nature of the S-C-P paradigm, we believe that extensions of this work could provide further interesting insights to policy makers and governments' officials.

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Notes

[1] The most favoured-customer clause (or the most favoured nation) is a promise by one party (e.g. supplier) to treat the other party (e.g. buyer) as it treats its most favoured-customer. That is to say if the supplier offers lower prices to his most favoured-customer, then any other buyer's price will be decreased as well.

[2] Greece has the lowest households and industrial electricity prices than any other European country (IEA, 2006).