

Pricing Electric Power under a Hybrid Wholesale Mechanism: Evaluating the Turkish Electricity Market

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ABSTRACT: During the restructuring process, Turkish electricity sector has gone through significant changes both in wholesale and retail markets. In this framework, the Market Financial Settlement Mechanism established for handling market imbalances has become a spot market in time. So, it can be claimed that the wholesale electricity market in Turkey is a hybrid mechanism composed of bilateral contracts and the balancing market. On the other hand, the main target of liberalization program is providing consumers with affordable electric power. Hence, this study attempts to explore the link between retail tariffs for ineligible consumers and prices in the two wholesale mechanisms, in the period after the launch of the day-ahead market. Findings suggest that regulated wholesale prices are more effective in the determination of end-user prices, whereas unregulated ones might have a price reduction effect in case the free market dominates. However, the volatility in spot market prices implies that the sector would better continue with the hybrid mechanism for quite some time.

Keywords: Electricity Prices; Wholesale; Retail; Competition; Turkey

JEL Classifications: D40; Q40; Q43

1. Introduction

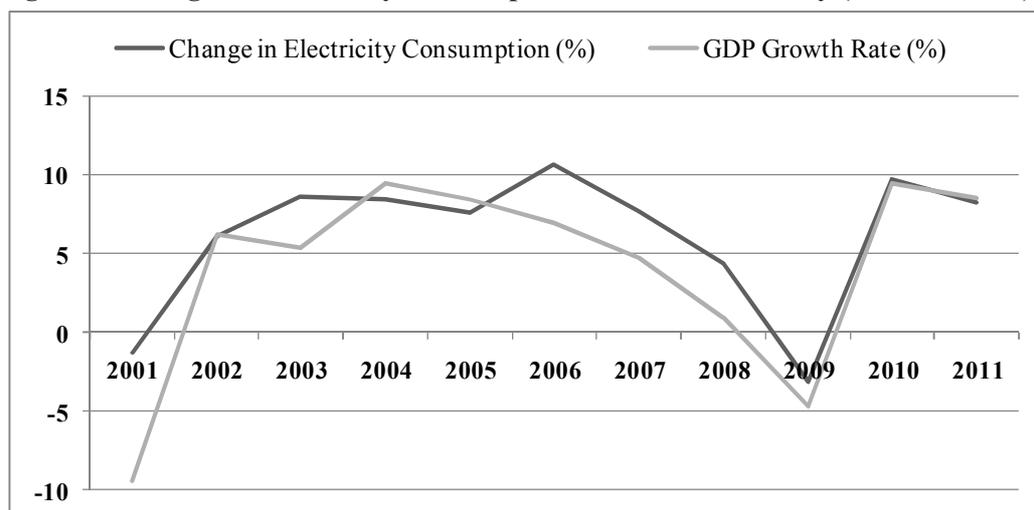
With an episode of sustained economic development along with a continuous population growth in the 2000's, Turkey experienced a considerable increase in energy demand in the last decade. In this context, national electricity consumption which was in the amount of 97.1 billion kWh (kilowatt-hour) in the year of 2001 rose to the level of 186.1 billion kWh in 2011. This development is in fact quite compatible with the empirical findings in the literature. Saatci and Dumrul (2013) find out that Turkey's energy consumption is positively related to its economic growth. Besides, Kaplan et al. (2011) conclude that an increase in energy consumption in Turkey directly affects economic growth and vice versa.

Figure 1 shows the rate of changes in electricity consumption as well as Gross Domestic Product (GDP) between 2001 and 2011. As the graph depicts, both variables exhibit a parallel trend of growth, where a sustainable increase is observed throughout the whole period except for the economic crises of 2001 and 2009. The consequent figures of change are also close to each other: Average growth rate of GDP between 2002 (the year when the economic development started) and 2011 turns out to be 5.4%, which, along with other factors, brings about a rise in electricity consumption in the rate of 6.8%. Following this pattern and in accordance with the growth targets concerning the year of 2023, which is the centennial anniversary of the Republic, the upward movement in the electricity demand is expected to continue and reach around 400 billion kWh by 2020, according to the projections made by TEIAS (Turkish Electricity Transmission Co.).

As a result of these developments, the electricity market has gained an increasing importance over the last decade, accelerating the sectoral restructuring efforts in terms of liberalization. The market that had gone through a series of changes since 1993 initiated further reforms in the beginning

of the 2000's, with the main purpose of encouraging retail competition. Upon the enactment of the *Electricity Market Law (EML)* in 2001, *TEAS (Turkish Electricity Generation and Transmission Co.)* was disunited into *EUAS (Electricity Generation Co.)*, *TETAS (Turkish Electricity Trading and Contracting Co.)* and *TEIAS (Turkish Electricity Transmission Co.)*, for the functions of generation, wholesale and transmission, respectively. The key objective stated in the Law was briefly "providing affordable, sustainable and quality electricity to consumers in a competitive environment". So, a national electricity market operating in a competitive environment was among the primary goals of the restructuring process.

Figure 1. Changes in Electricity Consumption and GDP in Turkey (% , 2001-2011)



Data Source: TUIK, TEIAS

It should be emphasized at this point that the process, expanded further in extent later, particularly involved the liberalization of retail and distribution companies. In this sense, the electricity distribution network administered by *TEDAS (Turkish Electricity Distribution Co.)* was divided into 21 areas to be privatized in the year of 2004, based on the Electric Power Sector Reform and Privatization Strategy Document. The privatizations, however, were physically launched in 2009, with the target of lowered costs due to the expected improvement of the mechanisms, resulting in reduced end-user prices. On the other hand, prices charged by retail and distribution companies continued to be regulated. In this sense, in order to foresee if the target of "reduced prices" would be ever fulfilled, the development regarding the end-user tariffs during the liberalization process should be explored.

Before getting into more detail, it should be noted that electricity retail market in Turkey is composed of two types of customers: Eligible and ineligible consumers. Eligible consumers are those who are entitled to choose their suppliers due to their electricity consumption higher than the threshold level determined and/or their direct connection to the transmission system. Ineligible consumers, on the other hand, are allowed to buy power only from retail and/or distribution companies in their region, mainly because their consumption level remains below the threshold, which was determined as 25,000 kWh per year in 2012.

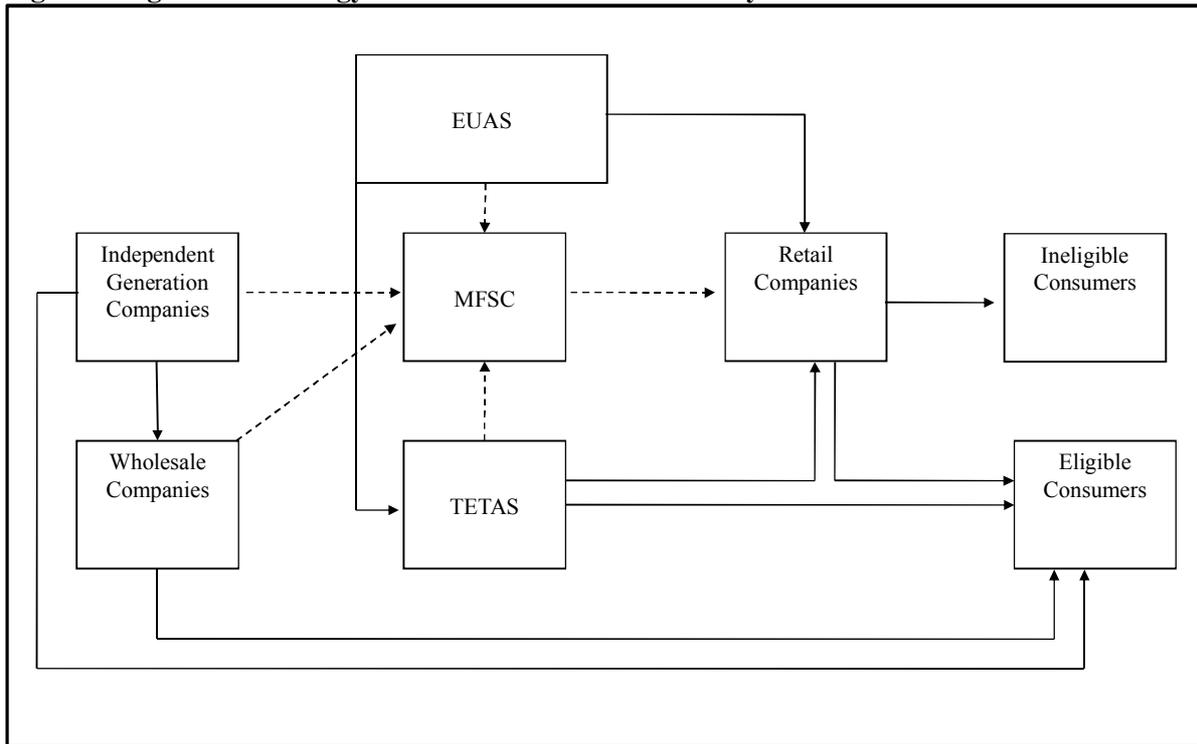
Accordingly, with the purpose of observing the development of tariffs in the Turkish electricity retail market from a specific point of view, this study ignores eligible customers in the market and solely focuses on the ineligible ones, which are formed primarily of households. This choice is related to the fact that retail and distribution companies have been the only source of providing electricity for this group during the liberalization process.

It should be also stated that based on the provisions of EML, retail activities were planned to be conducted by the retail firms as well as distribution companies that hold retail sale licenses. Although, with the aim of developing competition in the retail market, it is projected that distribution companies holding retail licenses would be required to fulfill retail activities under separate legal entities by 2013, there have not been any retail sale license holders apart from distribution companies

so far (Camadan, 2011). Hence, the ineligible consumers had to accept whatever price was imposed by those firms during the restructuring process.

In order to assess the developments in the retail supply market, the market mechanism in the sector should first be grasped. Figure 2 exhibits the electricity market in Turkey with the agents and energy flow circulating in it. The dashed lines represent the sales through the balance settlement mechanism, whereas the straight lines show those done via bilateral agreements. As the diagram illustrates, ineligible consumers provide the power they need only through retail and distribution companies, which purchase electricity from EUAS, TETAS and MFSC (Market Financial Settlement Center).

Figure 2. Agents and Energy Flow in the Turkish Electricity Market



Within the period of question, retail prices for ineligible consumers were determined as a function of the purchasing cost of electricity, a profit margin and some other costs. In this framework, the major determinant of the end-user tariffs was the cost of obtaining electricity from EUAS, TETAS and MFSC. In other words, retail tariffs were calculated as a function of prices paid to these three sources. Whereas the first two institutions sell electricity based on bilateral agreements, the sales of the last one depend on free market logic.

On the other hand, TETAS and MFSC can be also defined as the principal actors in the Turkish electricity wholesale market. So, among the three sources that sell electricity to the retail firms, two of them particularly are a matter of interest for the purposes of this study: MFSC prices due to the free market mechanism in which they are determined and TETAS prices due to their regulatory nature. Such an analysis would automatically yield a snapshot on the performance and role of the wholesale electricity market in the country, as well.

In this regard, a report published by European Commission on competition in the European energy sector reveals some negative impacts of regulated prices on the development of competitive markets due to their relatively low levels and an accordingly high dominance in the market. (European Commission, 2007) Thus, the developments in the Turkish case would give insights regarding the comparison of the two systems. In this regard, this paper attempts to illustrate how prices in the competitive mechanism differ from the regulated ones by examining the Turkish electricity sector. In sum, the purpose of this study is twofold:

- 1- Exploring the developments in the Turkish wholesale electricity market during the restructuring process, especially with the evolution of MFSC.
- 2- Evaluating the outcomes of regulated (bilateral) and unregulated (competitive) mechanisms, with a special emphasis on their effects on retail prices.

To date, the impact of the liberalization process in the Turkish electricity sector on retail tariffs has not adequately been explored in literature. Besides, the link between retail and wholesale electricity prices in the country has not yet been studied. That is why this paper would be a good and novel contribution to the literature, both in terms of evaluating the policies and their outcomes in the Turkish electricity market and discussing the comparative aspects of regulated and unregulated pricing mechanisms in the wholesale electricity sector.

2. The Wholesale Electricity Market in Turkey

The licensees in the Turkish wholesale electricity market serve basically under a hybrid system which is composed of bilateral contracts and the balancing market. The former one is utilized by a number of private companies in the field and by TETAS, which can be described as the sole public electricity wholesaler in the country. However, as the private wholesale companies do not provide electricity for ineligible consumers either directly or indirectly, they are neglected for the purposes of this study. So, from such a point of view, the only wholesaling agent in the country employing bilateral contracts is considered TETAS in this study. On the other hand, the second type of system used in the sector is the balancing market, implemented by the Market Financial Settlement Center (MFSC), which was initially established as a complementary mechanism to bilateral contacts and later turned into an electricity spot market. The developments in both mechanisms during the liberalization process are reviewed below.

2.1. TETAS: The Bilateral Contracts Mechanism

TETAS is a state-owned electricity wholesale company, founded primarily to execute long-term energy sale and purchase agreements with certain power plants. What it mainly undertakes for the recent years is buying the electricity generated by EUAS for a specific period that was determined by Energy Market Regulatory Authority (EPDK).

In March 2003, TETAS was granted the wholesale license by EPDK for a period of seven years. With further enactments, the period was extended to the end of 2012 due to the durations of the so-called transition period contracts. Accordingly, throughout the transition period, TETAS has been wholesaling electricity primarily to the 20 electricity retail and distribution companies in the country. The other agents in the sector to which TETAS sells electricity with quite minor shares can be stated as the Market Financial Settlement Center and some direct customers. Based on the targets set for the restructuring program, TETAS has been an important tool for the Turkish electricity market to smoothly pass to the competitive structure. In this respect, the share of national electricity trade it retained in the wholesale sector decreased from 85% during the period of 2001- 2006 to 35% in 2012 and is expected to go down further within the next years.

During the transition period, the wholesale tariffs charged by TETAS have been computed based on the costs incurred and held subject to the supervision of EPDK. In that sense, TETAS tariffs which have been applied through bilateral contracts constitute the essence of the regulated pricing mechanism in the electricity wholesale market in Turkey. Because TETAS wholesales a significant share of the national electricity and mostly trades with retail and distribution companies, it is important to observe the price changes made by it and their relevant effects on retail prices.

2.2. MFSC: The Market Balancing Mechanism

In 2004, in accordance with Law no. 4628, the bilateral contracts market in Turkey was projected to be supplemented by a balancing and settlement mechanism (EPDK, 2012). In this context, the first version of the Balancing and Settlement Regulation was first adopted in 2004 in a temporary nature, followed by the establishment of the balancing market in August 2006 by TEIAS. The main goal of the mechanism was indeed settling the production and price imbalances emerged from the consequences of bilateral agreements, by taking the offers of the participants who produce above or below their production programs and hence establishing an equilibrium of demand and supply in the market. Offers accepted by the National Load Dispatch Center and the imbalances were settled by the Market Financial Settlement Center (MFSC) at the end of each month. Accordingly, MFSC was composed of two key activities: Day-Ahead Planning and Balancing Power Market.

In April 2009, a final Balancing and Settlement Regulation was adopted which was put in effect in the month of December. The new regulation envisioned that the Day-Ahead Planning and Balancing Power Market within the previous system would be replaced with Day-Ahead Market and Real Time Balancing Market. The price determined in the day-ahead market on an hourly basis can in fact be described as a demand and supply equilibrium price which comes out of a match between the offers of generators and the bids from consumers.

The evolution of the balancing market is indeed of major importance for the restructuring process in the Turkish electricity market, particularly in terms of generating price signals and attracting investment into the sector. However, upon the opening of the market in 2006, most independent producers preferred to do trade through it instead of undertaking bilateral contracts. Consequently, MFSC, which was initially planned to manage a small portion of electricity trade lost its main function as a balancing market and started to operate as a spot market (Atiyas et al., 2012). For this reason, MFSC has recently been a significant mechanism within the Turkish electricity wholesale sector and should be explored along with its role in the determination of retail prices. An examination of MFSC would also yield an outlook for the results of an unregulated electricity wholesale market under the existence of a traditional regulated system. In other words, the analysis would provide the outcomes of the hybrid wholesale mechanism in the Turkish electricity sector.

3. Data and Analysis

In order to analyze the link between the wholesale and retail electricity markets during the liberalization process in terms of prices, one should first understand the components of retail tariffs. In the Turkish electricity sector, the average end-user tariff ceiling charged by retail and distribution companies are determined in specific periods of each year, simply by adding other costs on the costs of electricity purchases from different sources, along with a specific profit margin ceiling. Therefore, the following expression can be simply used to understand the pricing mechanism in the Turkish electricity retail market.

$$ARPC = ARPB \times (1 + \text{Profit Margin}) + \text{Additional Costs} \quad (1)$$

where

ARPC: Average Retail (end-user) Price Ceiling

ARPB: Average Retail Price Base

The first term (ARPB) on the right hand side of Equation (1) is computed by dividing the total electricity value that retail and distribution companies buy from EUAS, TETAS and MFSC by the amount of electricity. Additional costs, on the other hand, represent the costs other than the ones incurred through energy purchases, such as the loss and theft costs.

Consequently, as the equation above shows, end-user tariffs considerably hinge upon the average retail price base, two sources of which are the key mechanisms within the wholesale electricity market. In this regard, either through the bilateral contracts by TETAS or through the balancing mechanism of MFSC, prices formed within the wholesale sector are fundamental determinants of the retail tariffs of electricity provided for the ineligible consumers in Turkey. That is why, in order to assess the impact of wholesale tariffs on the end-user tariffs upon liberalization, it makes sense to observe the corresponding price changes in the retail sector and the two wholesale mechanisms within the period of question. Such an analysis would be also beneficial to compare the regulated and unregulated wholesale pricing mechanisms, in terms of the developments and relevant effects in their existence.

Data needed for the analysis are basically composed of nominal electricity tariffs. Retail prices are obtained from TEDAS sources based on single-term single tariffs for ineligible consumers (households) who provide electricity directly from retail and distribution companies. The variable called as “retail prices” in the analysis refer to ARPB, which is the relevant component in the end-user tariff calculation, in accordance with the framework of this study.

For the wholesale prices, on the other hand, two sources of data are benefited from: The single tariffs charged by TETAS which are withdrawn from EPDK, and the monthly average prices determined at MFSC. The monthly prices from MFSC are further averaged for the corresponding periods of TETAS and TEDAS prices. For consistency purposes, all the data used for the study starts with the beginning of 2010, as the MFSC prices are available only for the period after December 2009, which corresponds to the launch of the Day-Ahead Pricing Mechanism.

At this point, it should be once more emphasized that whereas TETAS and TEDAS tariffs are regulated by EPDK, MFSC prices are freely determined on a supply and demand mechanism. It should be also noted that for the calculation of real electricity prices within each interval throughout the period of interest, a price index is employed which is computed based on the consumer price index (CPI) data attained from TUIK (*the Turkish Statistical Institute*). In other words, tariffs in each period are inflation-adjusted using a relevant CPI, for a further analysis.

To sum up, the role of the two wholesaling mechanisms in the Turkish electricity market on the determination of retail tariffs for ineligible consumers between 2010 and 2012, a period in which intensive liberalization efforts were observed throughout the sector, is explored in this paper based on two analyses:

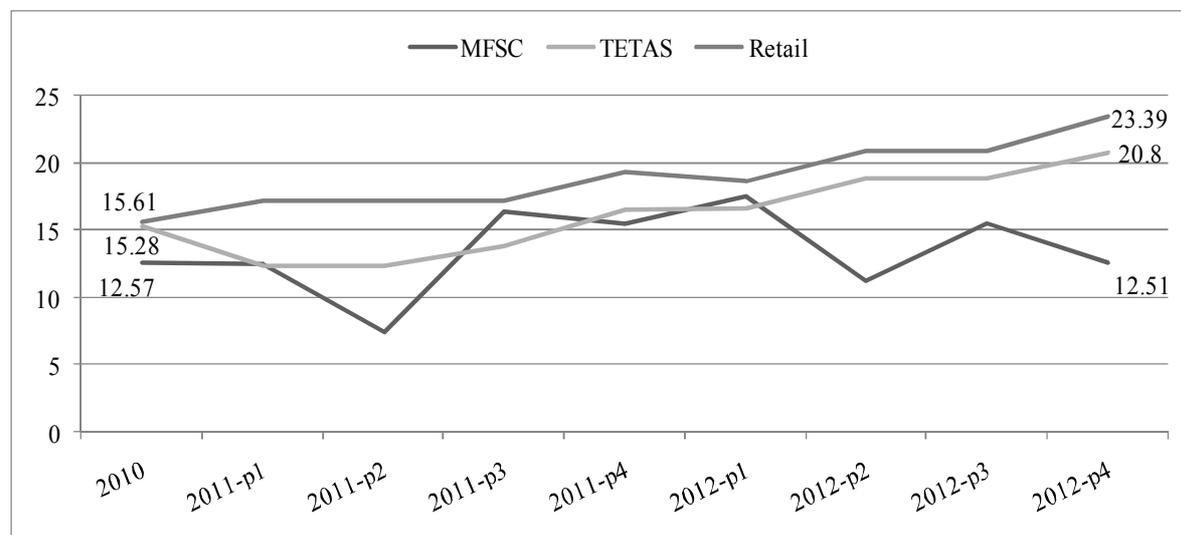
- 1- Changes in *nominal prices* charged by the agents in the wholesale and retail markets
- 2- Changes in *real prices* charged by the agents in the wholesale and retail markets

Whereas the first analysis basically reveals the pricing patterns of each mechanism during the period, results from the second one allows for seeing the net changes and also understanding the influence of the two wholesaling systems on the retail tariffs.

4. Findings

With the purpose of reviewing the developments in the wholesale and retail electricity markets in Turkey within the three years in question, the general patterns in the formation of prices are observed. In this sense, nominal electricity prices in Turkey are exhibited in Figure 3, where the trend in retail prices is revealed along with the lines for MFSC and TETAS that represent the wholesale prices. It should be noted that prices in the graph are given in terms of “TL cent” (1/100 of TL) per kWh (kilowatt- hour). Besides, the time intervals used in the graph are determined based on the periods at which EPDK announces new tariffs for wholesale and /or retail markets, in other words, TETAS and TEDAS tariffs. As an example, whereas a single electricity tariff was proclaimed throughout the year of 2010, tariffs were changed four times for both of the following years.

Figure 3. Nominal Electricity Prices in Turkey (TL cent/ kWh, 2010-2012)



Data Source: MFSC, TETAS, TEDAS

Note: “p” refers to “period”

One of the most apparent findings signified by the graph is the parallelism between the moves of the retail (ARPB) and TETAS prices: Both of them reveal a continuous rise during the period with quite similar ups and downs. Wholesale electricity prices of TETAS increase from 15.28 TL cents in the year of 2010 to 20.8 TL cents in the last quarter of 2012. Accordingly, end-user electricity prices charged by retail and distribution companies within the same period rises from 15.61 TL cents to 23.4 TL cents. So, the similar trend between the two is quite noticeable, implying the possibility of a strong correlation between regulated wholesale prices and retail prices for ineligible consumers.

On the other hand, the MFSC tariffs, which stand for the unregulated pricing mechanism, show a fluctuating performance with sharp swings from time to time that match the retail price changes only for a few periods throughout the three years of interest. As the graph depicts, the free market wholesale prices averaged at 12.57 TL cents in 2010 suddenly falls to the level of 7.41 TL cents in the second period of 2011 with a remarkable rise to 16.32 TL cents only within one period. Throughout the year of 2012, MFSC prices display peaks and valleys and end up at the level of 12.51 TL cents, which is even lower than the one in 2010. It is also an interesting observation that particularly in 2012, the retail and MFSC prices follow opposite directions. Put another way, the declines experienced at the spot market does not lead to reductions in retail prices. Thus, the effect of the wholesale prices created at the free market does not seem to be strong on the formation of the end-user tariffs.

Apart from the developments observed in terms of nominal price levels, a further analysis including inflation-adjusted tariffs is needed as well in order to be able to identify the net changes in all of the three markets. For this reason, periodical prices discussed above are adjusted by CPI with 2010 as the base year to obtain the real prices in the sectors between 2010 and 2012. Prices calculated for this purpose are given in Table 1.

Table 1. Real Electricity Prices in Turkey (TL cent/kWh, 2010-2012)

<i>Period</i>	<i>MFSC Prices</i>	<i>TETAS Prices</i>	<i>Retail Prices</i>
2010	12.57	15.28	15.61
2011-p1	12.04	12.09	16.67
2011-p2	7.02	11.74	16.31
2011-p3	15.43	13.10	16.25
2011-p4	13.87	14.84	17.28
2012-p1	15.37	14.68	16.31
2012-p2	9.71	16.37	18.04
2012-p3	13.41	16.40	18.08
2012-p4	10.51	17.47	19.64
Change (TL cent)	-2.06	2.19	4.03
Change (%)	-16.38	14.32	25.84

Data Source: MFSC, TETAS, TEDAS, TUIK, Authors' Calculations

Note: "p" refers to "period"

The general price pattern reveals that regulated wholesale tariffs (TETAS) are higher than the unregulated ones (MFSC) in most periods. Also, as seen in the table, the net real change in the free market wholesale prices is negative: Real MFSC prices decline by 16.38%, corresponding to a value of 2.06 TL cents/kWh within three years. So, although highs and lows are observed throughout the period, the final status regarding the spot market prices is a reduction.

On the other hand, the change in the regulated wholesale tariffs is in an opposite direction: TETAS wholesale prices on bilateral contracts increases in the amount of 2.19 TL cents/ kWh (by 14.32%) within the same time interval. Retail prices move in a similar but more aggressive pattern with a rise of 4.03 TL cents /kWh (25.84%). As a result, it seems that whereas real MFSC prices exhibit a downward trend, TETAS and retail tariffs go upward, suggesting that regulated tariffs are more influential on the determination of the retail prices.

5. Conclusions

Within the framework of the restructuring process in the Turkish electricity sector, various reforms were put in effect both in the wholesale and retail markets. Besides, it is known that the electricity prices paid by the ineligible consumers in Turkey are determined by retail and distribution companies who provide power mainly from the wholesale market in addition to EUAS, which is the public electricity generation company of the country. It should also be underlined that the wholesale electricity market in Turkey has a hybrid nature, operating via bilateral contracts (TETAS) as well as a

market balancing mechanism (MFSC). In this regard, it is a matter of interest to explore the role played by the two different wholesale mechanisms in the determination of basic retail prices upon liberalization. Hence, this study focuses on this issue by analyzing the tariffs in both sectors and their relationships between the years of 2010 and 2012.

The analysis yields four key findings summarized below:

- In nominal terms, there is a strong cohesion between the development of TETAS and retail tariffs, whereas MFSC prices do not follow a similar trend. This implies the existence of a possible dominant impact of regulated tariffs on the pricing in the retail market.
- Regulated wholesale tariffs exhibit an upward but consistent pattern, while unregulated prices experience sharp ups and downs in certain periods.
- In real terms, regulated tariffs turn out to be higher than the unregulated ones in the wholesale market, suggesting the potential price reduction effect of the free market due to competition.
- In real terms, regulated wholesale tariffs increase along with retail prices during the three years of question. On the other hand, prices in the free market go down, pointing out that the price reductions at MFSC are not reflected on retail prices and hence signaling the weak effects of the unregulated wholesale market during the period of interest.

Thus, data analysis evidently shows that regulated wholesale mechanism through bilateral contracts result in higher prices than those determined in the spot market. Plus, it seems that they have stronger influence on the formation of retail prices in the Turkish electricity sector. In this sense, MFSC, apart from its major task of market balancing which ensures the security of energy supply, might be a beneficial mechanism to yield lower prices for consumers. On the other hand, analysis also reveals that significant price fluctuations are possible to be observed in such a mechanism, mainly due to instantaneous demand changes. So, from that perspective, bilateral contracts can be considered safer in terms of serving as a hedge against the inconsistency of spot prices. Accordingly, it does not currently seem reasonable to imagine a wholesale electricity market in Turkey where the agents totally hinge upon the free market and waive bilateral agreements. However, it should be kept in mind by policy makers that the existing dominant price regulation mechanism can be a barrier in front of the potential progress of competition in the retail market.

As a result, in the framework of further restructuring efforts in the Turkish electricity sector, free wholesale market can be taken advantage of with the purpose of achieving affordable retail tariffs for ineligible consumers. Nevertheless, the safety assured by the regulated prices does not yet look like to be given up. That is why it can be concluded that the hybrid nature of the Turkish electricity market should continue for a certain amount of time, with gradually increased support to competition until it matures to some degree.

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