Barcelona School of Economics

Competition and Market Regulation 2021-2022

"Estimating the Conduct of Istanbul's Diesel Oil Market"

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ABSTRACT IN ENGLISH (100 words)**:**

Turkey's oil industry has been experiencing increasing retail diesel prices over the years. The Energy and Market Regulatory Authority has intervened into the market several times because of anti-competitive retail prices. This paper analyzes the competition level in the market, by using the conduct parameter. The empirical results show us that the competitiveness in the market has changed over time due to the interventions by the TCA and EMRA, marked by the changes in the conduct parameter. Although the market was never in full collusion, it is observed that the conduct parameter has decreased with each intervention.

ABSTRACT IN CATALAN/ SPANISH (100 words)

La industria del petróleo de Turquía ha experimentado un aumento en los precios minoristas del diésel a lo largo de los años. La Autoridad Reguladora de Energía y Mercados ha intervenido en el mercado varias veces debido a precios minoristas anticompetitivos. Este reporte analiza el nivel de competencia en el mercado, utilizando el parámetro de conducta. Los resultados empíricos nos muestran que la competitividad en el mercado ha cambiado a lo largo del tiempo debido a las intervenciones de la TCA y la EMRA, marcados por los cambios en el parámetro de conducta. Si bien el mercado nunca estuvo en plena colusión, se observa que el parámetro de conducta ha ido disminuyendo con cada intervención.

KEYWORDS IN ENGLISH (3)**:**

"Istanbul Oil Market" "Conduct Parameter" "Collusion"

KEYWORDS IN CATALAN/ SPANISH (3)**:**

"Industria del petróleo de Estambul" "Parámetro de conducta" "Colusión"

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1. Introduction

1.1. Purpose

The rise of fuel oil prices has always been an important part of public debate, especially in Turkey where fossil fuel is one of the main drivers of the economy. On the consumer side, the key concern of increasing oil prices is a direct impact on retail prices and a decrease in consumer surplus. In this study, we aim to use econometric modeling techniques to conduct an empirical analysis of the conduct of the Istanbul oil market–which accounts for 25 percent of the total oil consumption in Turkey–and how the competitiveness in the market changes over time.

As a developing country, the Turkish economy has grown rapidly in the past decade compared to its peers. Its oil consumption has also grown in parallel with this economic growth[1]. With a population of over 80 million and a GDP of 800 billion, Turkey is a major consumer of fuel oil and gas. The average contribution of fuel oil to gross domestic product is 3.1% over the last 5 years[2].

In the years 2009, 2012, 2014 and 2021[3], The Energy and Market regulatory Authority (EMRA) intervened in the retail oil prices in order to protect consumers from the increasing retail prices due to high margins of oil distributors and dealers[4]. As a result of these interventions, the retail price of fuel oil has decreased across the country.

Although there are many companies operating in the retail market that serve homogenous products, there has been some margin-seeking behavior in the market.

[1] Energy Resource Guide - Turkey - Oil and Gas.
[2] Fuel Distribution Sector in Turkish Economy: Place and Importance. PWC, 2007,
[3] Turkish Competition Authority, decision no 20-14/192-98, 03.12.2020.
[4] EMRA president Mustafa Yılmaz statement, 16.03.2021.

Istanbul is the biggest city in Turkey which accounts for 25% of total fuel consumption[5]. Furthermore, the product of diesel accounts for 90% of the total consumption[6]. Taking into account the relatively large market share of Istanbul and the most preferred oil type as a diesel, we estimated the change in the conduct parameter over time in relation to the market disciplinary efforts by EMRA, Turkish Competition Authority (TCA), and demand and cost shocks.

1.2. Market Information

1.2.1 Market Shares of Top Eight Fuel Distributors.

Distributor	2018	2019	2020
PO	22,40	22,47	23,60
OPET	17,83	19,79	20,54
SHELL	14,92	14,99	14,33
BP	8,49	8,04	7,24
GÜZEL	5,16	5,11	5,54
TP	3,74	3,95	4,34
AYTEMİZ	4,22	4,07	4,01
AKPET	1,38	2,22	2,15
Others	21,86	19,36	18,25

Source: Energy Market Regulatory Authority, Turkish Petroleum Market Report, 2018, 2019 and 2020.

In the Turkish oil industry, there are over a hundred distributors operating in the market. The distributors with the highest overall market share are Petrol Ofisi A.Ş (PO), Opet Petrolcülük A.Ş. (OPET), Shell Turcas Petrol A.Ş. (SHELL), and BP Petrolleri A.Ş. (BP), Güzel Enerji Akaryakıt A.Ş. (GUZEL), TP Petrol Dağıtım A.Ş. (TP), Aytemiz Akaryakıt Dağıtım A.Ş. (AYTEMIZ), Akpet Akaryakıt Dağıtım A.Ş. (AKPET). Their market shares are 23,60%, 20,54%, 14,33%, 7,24%, 5.54%, 4.34%, 4,01% and 2,15% respectively in the year 2020. They collectively hold a market share of 82% in 2020. The other distributors operating in the market have market

[5] Energy Market Regulatory Authority, Turkish Petroleum Market Report, 2020
[6] Energy Market Regulatory Authority, Turkish Petroleum Market Report, 2020

shares below 1%. As can be seen from the relatively high market shares of the top 8 distributors, the market structure in the fuel industry in Turkey can be described as oligopolistic.

According to TCA's Fuel Industry Report[7] (2008) "*Although there are forty-seven operators licensed by the EMRA, only five undertakings dominate approximately 90% of the market, and this situation remains unchanged for a long time. Therefore, in terms of competition law, the most important problem in the oil sector is the existing "oligopolistic market structure" and this structure must be changed to establish a permanent competition*."

Competition in the fuel market in Turkey has increased in the last 14 years, however, there has not been any visible change in the oligopolistic structure.

1.2.2 Total Consumption of Gasoline and Diesel[8]

	2018	2019	2020
Gasoline	9,01	9,66	9,40
Diesel	89,88	89,23	89,66
Others	1.09	1.11	0,94
Total	100	100	100

Diesel holds the highest consumption rate of almost 90%, compared to gasoline which has a consumption rate of 9% in Istanbul.

1.2.3 Market Structure In Istanbul for Diesel Product

Distributor	2020
OPET	27,71
SHELL	27,8

[7] Turkish Competition Authority Oil Sector Report, 2008
[8] Energy Market Regulatory Authority, Turkish Petroleum Market Report, 2020

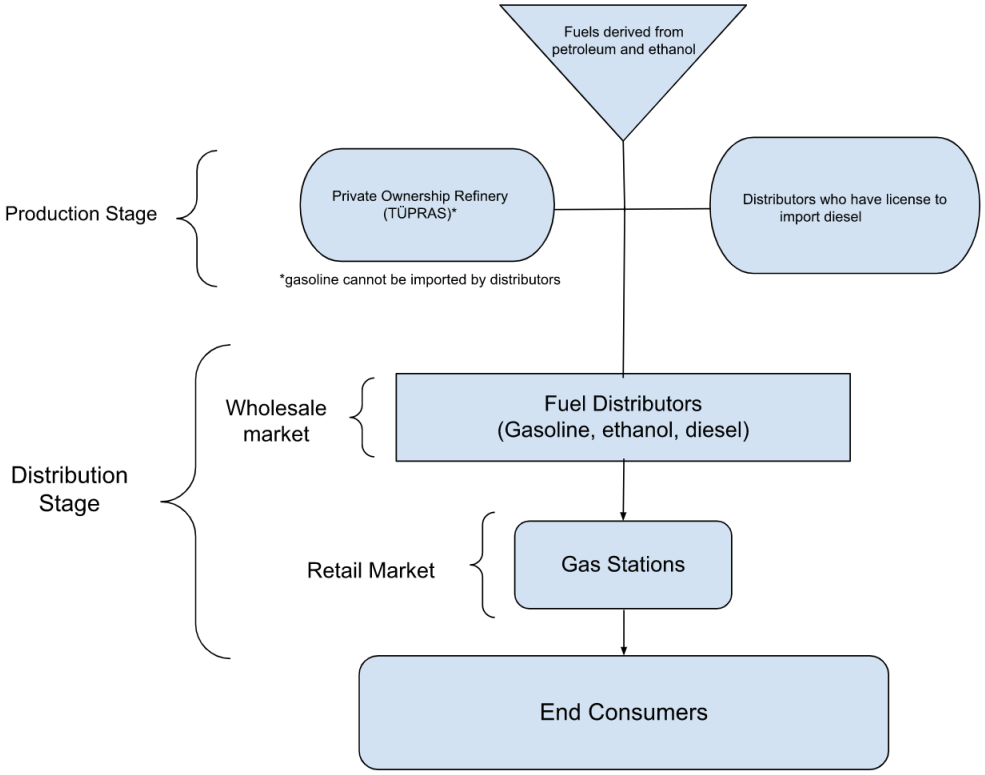
PO	18,3
BP	9,79
GUZEL	8,08
AYTEMİZ	2,06
TP	1,07
AKPET	0,003
Others	**4,61**
Source: Energy Market Regulatory Authority, Turkish Petroleum Market Report, 2018, 2019, 2020.	

In the region of Istanbul, there are over 30 distributors operating in the market. The distributors with the highest overall market share are OPET, SHELL, PO, BP, GUZEL, AYTEMIZ, TP, and AKPET with market shares of 28%, 28%, 18%, 10%, 8%, 2%, 1%, and 0,003% respectively in the year 2020. They collectively hold a market share of 95% for diesel in 2020 compared to the rest of the market. Similar to the entire Turkish oil industry, the Istanbul region also has an oligopolistic market structure.

1.2.4 Supply Chain

In Turkey, 90% of oil products are supplied through imports. In the case of domestic production, crude oil is processed into gasoline, diesel, biodiesel, and other products by refineries that are within the Türkiye Petrol İşletmeleri A.Ş (TUPRAS) and provided to distributors. In the case of imports, crude oil is directly imported by TUPRAS. The oil products that are both exported and produced are delivered to terminals (filling centers) by distributors through pipelines, seaways, and highways. The dealers get the fuels from the terminals through fuel tankers and supply them to the final consumers in the stations.

Figure 1.2.4.1: The Fuel Chain



According to the EMRA regulation, gasoline cannot be directly imported by oil distributors. However, diesel can be imported by distributors from different resources other than TUPRAS. The main reason to import diesel directly is to decrease costs. One of the main obligations of distributors is to buy fuel from the vertically integrated distributor with whom they have a contract. These contracts are limited to five years to increase competition between dealers.

1.2.5 Pricing

According to the Petroleum Market Act No. 501 Act, the previously state-owned refinery monopoly, TUPRAS, announces its ex-refinery ceiling price through the regulatory body EMRA. Based on these ceiling prices, distribution companies determine their fuel pump prices. These prices are also announced online by EMRA, through a publicly accessible portal.

However, as will be explained in the next section, EMRA is authorized to take the necessary measures to determine a binding ceiling price when actions of oil distributors are aimed at blocking or restricting competition or creating disturbances in the market.

Table 1.2.5.1: Evolution of fuel prices.

(REFINERY PRICE) **Cost of Oil Excise Duty + Energy Market Regulatory Authority Margin + Refinery Margin**	Refinery price is the sum of Duty-Free Refinery Price (cost of oil) and refinery margin, EMRA margin and excise duty.
(DISTRIBUTOR TERMINAL PRICE) **(Refinery Price+Sea Freight)**	The terminal price is calculated by adding distributors' sea freight costs to the refinery price.
Inland Freight	The pump price of oil is calculated by adding the inland freight costs of dealers to the terminal price, value added tax and total profit of vertically integrated firms.
Value-added Tax	
RETAILERS PRICE	

The refinery price consists of the cost of oil, excise duty, EMRA's, and TUPRAS's margins. The main ingredient in the refinery price is the price of crude oil (European Platts) and the exchange rate. The Duty-Free Refinery Price is calculated by converting the prices published in Platts European MarketScan as CIF MED (Genova/Leverage) $/TON, taking into account the US dollar exchange rate and densities.

The terminal price consists of the refinery price and sea freight cost incurred by the distributors. The retailer's price is the sum of tax, margins of distributor and dealer, and the inland freight which is incurred by dealers.

Any change in the cost, tax, and margin of parties is reflected in the retail prices. The main ingredient in the cost of oil is the refinery price which primarily depends on the price of the European crude oil prices and the exchange rate of the Dollar. According

to the EMRA, 50% of the final price of the fuel consists of taxes and the EMRA income share, 40% of the cost of the product, and 10% of the margin of the companies operating in the market[9].

1.2.6 Interventions in the market by Regulatory Authority and Turkish Competition Authority

1.2.6.1 Energy Market Regulatory Authority's Decisions

EMRA is authorized to take the necessary measures to determine binding ceiling prices when competition is blocked or restricted or when there is a disturbance in the market structure.

According to Article 10 of the Petroleum Law No. 5015, EMRA can intervene in the market in situations where "*agreements and actions that are aimed at hindering, disrupting, or restricting market activities or competition in the market, or that results in or may result in this effect, have disruptive effects on the market organization*".

EMRA intervened in the oil market in 2009, 2014, 2015, and 2021. After analyzing the retail oil prices of distributors from 2005 to 2008 EMRA decided that the prices in the market have similarities to the markets in which competition was disrupted and as a result of the decision limited the margins to be obtained by distributors and dealers.

In March 2021, the EMRA implemented a ceiling price decision for gasoline and diesel for two months starting from April 2021. EMRA's reference price is taken as the competitive average price formed in the nearest free oil market. EMRA requires oil distributors to set retail prices based on the average price forms in the European market. As explained above, if the retail price of oil exceeds the competitive reference price; that is, if the margins of dealers and distributors exceed the competitive level, the EMRA intervenes in the market.

[9] Energy Market Regulatory Authority, Turkish Petroleum Market Report, 2020.

In the statements made by EMRA, it is stated several times that the prices of well-known brands are higher than the rest of the market and that consumers should buy the cheapest brands as the product is homogenous.

The interventions and the statements made by the regulatory authority targeting the top 8 distributors raised concerns about whether there is an agreement that may cause a competitive concern in this market or not. The oligopoly and vertically integrated structure of the market and the price transparency as a result of regulations raise the suspicion that an agreement may exist in the market.

1.2.6.2 Turkish Competition Authority's Decision

A preliminary investigation of the top 8 oil distributors by the TCA started in July 2018. In September 2018, the TCA opened an in-depth investigation. After two years, the final decision was made in February 2020 in which it fined the first top 4 distributors for resale price maintenance.

The main motivation behind the decision is that BP, Opet, PO, and SHELL, which are the top four fuel distributors, had interfered with the fuel stations' pump prices by not allowing them to sell below the recommended retail price.

2. Literature Review

Many authors have pointed out the difficulty of indicating whether or not there collusion exists by observing only the variables of cost, price, and current demand. This is because non-cooperative behavior can be compatible with diverse price patterns. However, dynamic pricing models have established relationships that make it possible for us to establish the firm and market competitive behavior over time.

Kováč, Putzová, and Zemplinerová (2005)[10] in their paper described ways to identify collusion when there is a lack of explicit agreement using a game-theoretical method to illustrate the factors that discourage tacit collusion and factors that help sustain tacit collusion. Some of these factors. as described by **Ivaldi et al. (2003)**[11]**,**

[10] A Survey of Collusion in Gasoline Market, 2005
[11] The Economies of Tacit collusion, 2003

are the number of firms, entry barriers, frequency of interaction, transparency of prices, demand changes, technological changes, asymmetries, product heterogeneity & complexity, and multiple markets, demand elasticity, and buying power.

Borenstein and Shepard (1996)[12]'s paper focused on testing for tacit collusive pricing behavior, primarily in retail gasoline markets by examining the retail margins. The characteristics of the gasoline market are ideal for the test since the theoretical models, which are tested in the paper, rely on predictable changes in demand and marginal costs. Borenstein and Shepard use the insights from super game models of tacit collusion that self-enforcing collusion is maintained when the loss from punishment for defection is more than the immediate gains from defecting.

Rotemberg-Saloner (1986)[13] are more theoretical papers that created a model in which firms are able to sustain implicit collusion by anticipating changes in demand and adjusting their current margins accordingly. As the demand shocks are identically and independently distributed, current demand will have no effect on expected future demand and expected penalties will remain constant. Therefore, collusion can be maintained only by reducing margins in periods of high demand.

Another model referred by Borenstein-Shepard's paper is that of **Haltiwanger-Harrington(1991)**[14] whose model, applies theories of collusion to a deterministic demand cycle and shows that collusion is more difficult to sustain when future demand is expected to decline or if costs are increasing.

Genovese and Mullin (1998)[15] aim to explore the different methodologies used to calculate the conduct of a static oligopolistic market while taking into account the unobserved cost components. The authors note that in most cases, marginal costs are difficult to observe therefore, conduct and costs are measured using the "responsiveness of price to changes in demand elasticities and cost components". Using a generalized monopolist's profit first order condition, they are able to

[12] Dynamic Pricing in Retail Gasoline Markets, 1996
[13] A Supergame-Theoretic Model of Price Wars during Booms, 1986
[14] The Impact of Cyclical Demand Movements on Collusive Behavior, 1991
[15] Testing Static Oligopoly Models: Conduct and Cost in the Sugar Industry, 1998

estimate the conduct parameter, θ, which under perfect collusion or monopoly, equals 1 while in a perfectly competitive market, equals 0. The authors note the NEIO method hasn't been "tested" since alternative methods to measure conduct and costs haven't been presented yet. The paper uses the US East Coast cane sugar refining industry to assess this methodology.

The methodology used by Geneovese and Mulin is similar to that used in this paper. Unlike previous literatures, our study estimates the conduct parameters specifically for the Turksih Oil Industry over time.

Alper and Torul (2009)[16]'s paper were the first to investigate the asymmetrical relationship between crude oil prices and gasoline prices in Turkey. The study does an empirical investigation of the impact of the crude oil shocks on retail gasoline prices in Turkey using a structural-VAR analysis. They argued that the Turkish retail gasoline prices respond significantly to increasing world crude oil prices but are unaffected by decreasing world crude oil prices. The source of asymmetry was found to be mainly attributed to government price-setting policy choices for gasoline which attempts to maximize tax revenue from gasoline.

Biressioğlu et al, (2014)[17] aimed to identify the factors that cause the fluctuations in gasoline pump prices in Turkey through statistical analysis by using variables such as consumption, crude oil prices, exchange rate, and inflation. According to their results, the retail pump prices are preliminarily determined by more macroeconomic variables, rather than distributors' margins and land transportation rates. The market was found to operate, in the case of oil prices, by adjusting the range of profit margins defined by the government. The price adjustments were generally made towards maintaining a stable price, therefore can be perceived as an auto-regulatory mechanism implemented by players.

[16] Asymmetric Adjustments of retail Gasoline Prices in Turkey to World Crude Oil Price Changes: The Role of Taxes, 2009
[17] The Rationale Behind Turkey's High Gasoline Prices, 2014

3. Research Question

The paper aims to discover how the competitiveness in the Istanbul diesel market changes over time by estimating the conduct parameter of the whole market and of the distributors in the market.

This paper attempts to do so by estimating the demand of the Istanbul gasoline market using interest rates as an instrument for price in order to obtain the price elasticity of demand.

4. Methodology

4.1. Data & constraints

In this study, we use the daily retail price per liter of diesel in Istanbul obtained from the EMRA portal from the years 2016 to 2021, aggregated to monthly data. We use this data to estimate the average market retail price per month. Additionally, we have obtained the monthly retail price of the top 8 companies in the market, cost of raw materials per liter, taxes, refinery and EMRA margins, and quantity in tonnes from the EMRA Pricing Reports[18]. In our estimation, the costs of raw materials per liter, refinery and EMRA margins, and taxes are the same for all companies in the market. Additionally, we used the monthly average price of the whole market and monthly average price of the top 8 companies to estimate the average price of the remaining companies in the market. Hence in our estimation, we have 3 main groups in the market: 'top 8' (the largest 8 distributors that account for 82% of the market shares), 'others' (the remaining distributors in the market), and 'whole' (the market as a whole).

The main ingredients of the cost of diesel are crude oil prices, EMRA and TUPRAS margin, and the tax. In our data, we used European Platts Market Scan prices as crude oil prices only may not reflect the actual cost[19].

[18] EMRA, Pricing Reports 2016, 2017, 2018, 2019, 2020.
[19] EMRA, Pricing Reports, January, 2021

4.2. Theory & demand specification

4.2.1. Conduct Parameter

In a homogenous product market we could nest the competitive, Cournot oligopoly, and monopoly models into one generalized profit function for firm i:

$$\Pi_{it} = P(Q)_{it} q_{it} - C_{it}(q_{it})$$

Taking the first order conditions, we obtain

$$P(Q_t) + \theta_{it} \frac{dP}{dQ} q_{it} - C'_{it}(q_{it}) = 0$$

$$C'_{it}(q_{it}) = P_{it}(1 + \frac{\theta_{it}}{\alpha_1})$$

$$\theta_{it} = -\alpha_1 (\frac{P_{it} - C_{it}'(q)}{P_{it}}) \qquad (1)$$

Where $C'_{it}(q_{it})$ denotes firm i's marginal cost at time t, $\frac{dP}{dQ}$ is the inverse industry demand function, q_{it} is quantity of firm i at time t, Q_t is the market demand at time t, and α_1 is the price elasticity of demand.

θ_{it} is the conduct parameter for firm j at time t, which measures the magnitude of the mark-up. When θ_{it} is zero, the firm is in perfect competition when it is 1, the firm is competing a la Cournot and when it takes a value of N the firm is in full collusion.

Accordingly, in an aggregate model with identical firms, we assume that $q_j = Q/N$. Hence, the aggregate generalized first-order condition becomes:

$$P(Q_t) + \theta_t \frac{dP}{dQ} \frac{Q}{N} = C'_t(\frac{Q}{N})$$

Or

$$P(Q_t) + \phi_t \frac{dP}{dQ} Q_t = C'_t(Q)$$

$$C'_t(Q/N) = P_t(1 + \frac{\phi_t}{\alpha_1})$$

$$\phi_t = -\alpha_1(\frac{P_t - C'_t(Q)}{P_t}) \qquad (2)$$

ϕ is the market conduct parameter that takes different values under different competitive regimes:

ϕ = 0 under perfect competition; ϕ = 1/N under symmetric Cournot; ϕ = 1 under monopoly or cartel.

4.2.2. Demand Estimation

In order to estimate the price elasticity of demand α_1 we construct a demand equation:

$$Q_{it} = \beta_o + \alpha_1 P_{it} + \beta_1 X_{it} + \varepsilon_{it}$$

Where Q_{it} is the quantity of firm i at time t, β_o and β_1 are the constants, α_1 is the price elasticity of demand, P_{it} is the instrumented price variable, X_{it} are demand control variables.

In the case of the aggregate whole market demand, we use:

$$Q_t = \beta_o + \alpha_1 P_t + \beta_1 X_t + \varepsilon_t$$

From the obtained price elasticity of demand α_1 we could then insert to our conduct parameter equations (1) and (2).

To account for the endogeneity in price which affects our estimation of the elasticity of demand, we have used a two-stage least squares regression in our model. We use the fluctuations in US Dollar and Turkish Lira (USD/TRY) interest rates as an instrument in our model.

5. Results

5.1. Markups

Figure 5.1.1: Mark-ups of top 8 companies, 2016-2021

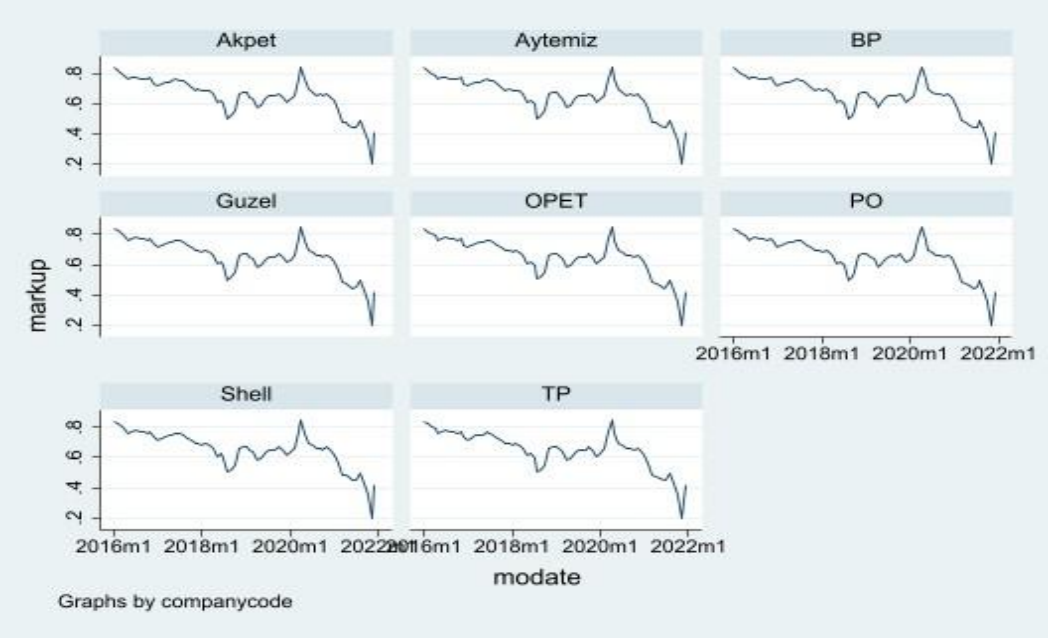


Figure 5.1.2: Mark-up of top 8 companies overlapped, 2016-2021

Figure 5.1.3: Mark-up by group, 2016-2021

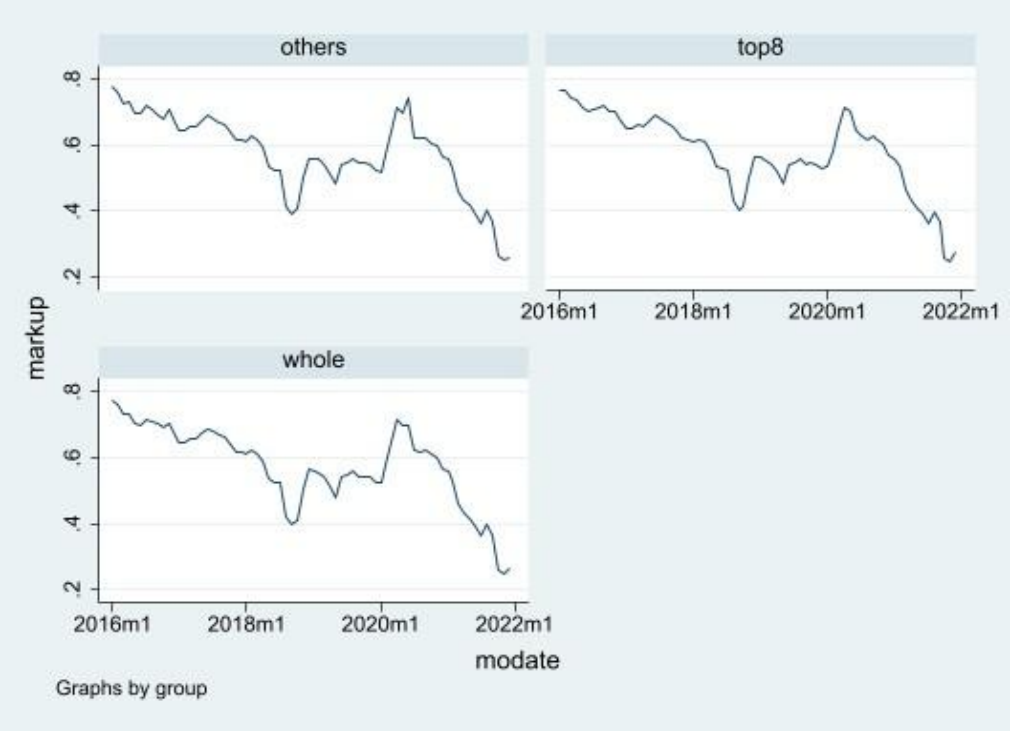


Figure 5.1.4: Mark-up by group overlapped, 2016-2021

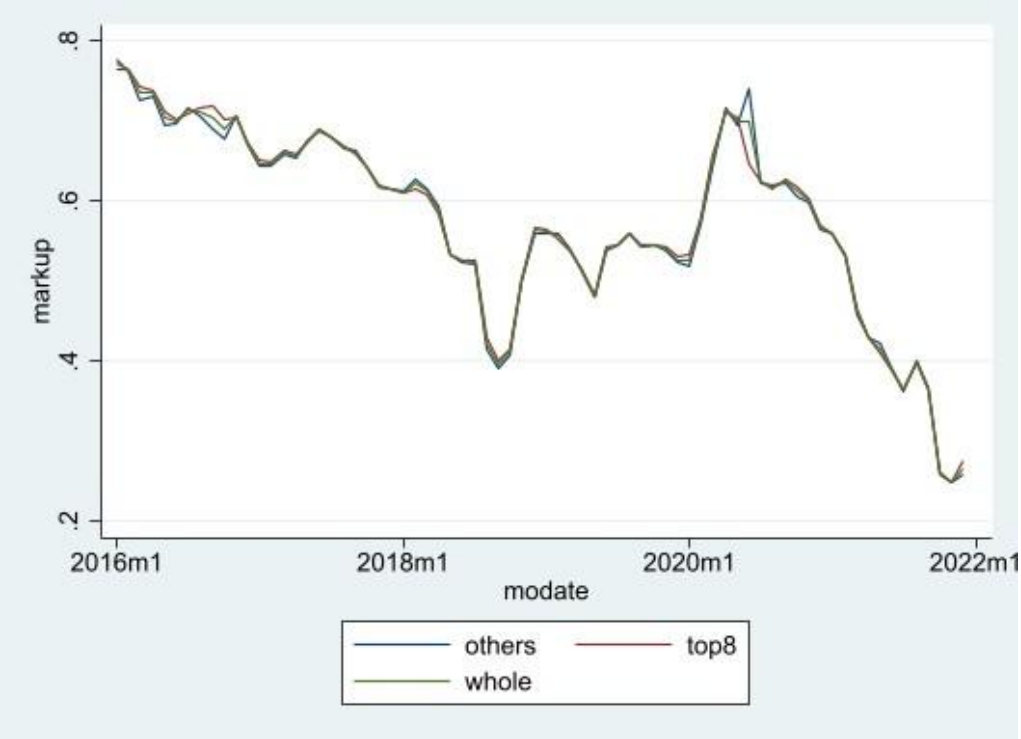
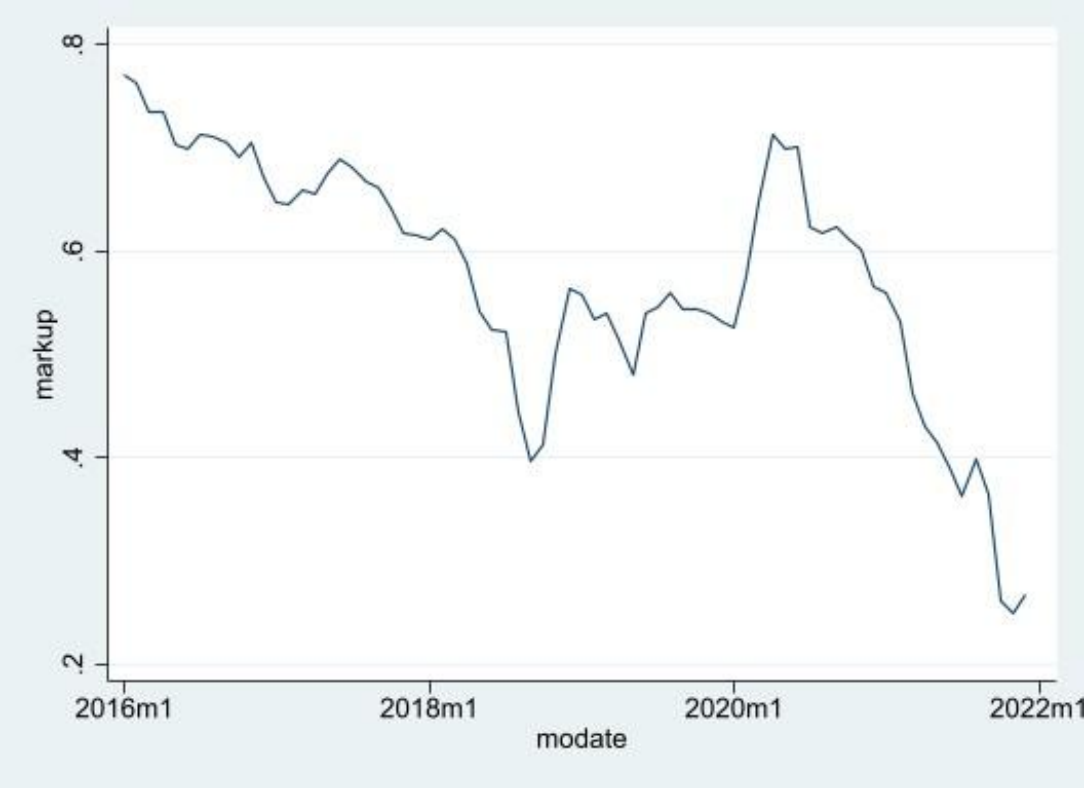


Figure 5.1.5: Mark-up of the whole industry, 2016-2021



The mark-up of the top 8 oil distributors seem to move in parallel with each other (Figure 5.1.1). Additionally, Figure 5.1.2 also shows that the margins of all distributors in the market move almost in the same way. One explanation for this similarity is the price transparency in the market. From the beginning of 2015, the EMRA required all market participants to enter their daily price changes into the online portal of EMRA which is available publicly. As a result of that, distributors and dealers can observe their competitors' prices in the market and make their pricing decisions accordingly.

Taking into account the comparatively bigger market share of the top 4 oil distributors in Istanbul, it is significantly possible that the other companies follow the pricing behavior of the top 4 companies in setting their retailer's prices.
Hence, one possible explanation is that this price transparency could increase the probability of tacit collusion between the firms. Another explanation could be that

the oligopolistic structure of the market itself facilitates price parallelism among the firms.

On the other hand, the mark-ups could be moving in a similar direction because of the similarity of the costs that are affected by the same shocks.

5.2. Demand estimation and elasticities

Table 5.2.1: Demand estimation of Istanbul diesel market 2016-2021, panel monthly data of individual top 8 firms

	(1)	(2)	(3)
	lnq	lnq	lnq
lnp	-0.576	-0.662*	-0.658*
	(-1.94)	(-2.13)	(-2.14)
seasonality		Yes	
q1			-0.182***
			(-4.34)
q2			-0.168***
			(-5.93)

q3			-0.0587**
			(-2.69)
_cons	10.72***	10.99***	10.96***
	(27.15)	(26.49)	(26.65)
N	576	576	576

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

For our conduct parameter, we will take the price elasticity of demand using equation 3, which is -0.658.

Table 5.2.2: Demand estimation of Istanbul diesel market 2016-2021, panel monthly data of each group

	(1)	(2)	(3)
	lnq	lnq	lnq
lnp	-0.194***	-0.264***	-0.263***
	(-3.84)	(-5.52)	(-5.41)
seasonality		Yes	

q1			-0.152***
q2			
q3			-0.0273
			(-1.00)
_cons	12.12***	12.32***	12.32***
	(17.36)	(17.63)	(17.64)
N	216	216	216

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

For our conduct parameter, we will take the price elasticity of demand using model 3, which is -0.263.

Table 5.2.3: Demand estimation of Istanbul diesel market 2016-2021, time series for the whole market

	(1)	(2)	(3)
	lnq	lnq	lnq
lnp	-0.214*	-0.285***	-0.283***
	(-2.43)	(-3.51)	(-3.39)

seasonality		yes	
q1			-0.155**
			(-3.24)
q2			-0.138**
			(-2.91)
q3			-0.0283
			(-0.60)
_cons	12.91***	13.11***	13.11***
	(85.98)	(83.06)	(85.74)
N	72	72	72

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The sign of the price coefficient for all three regressions are in line with economic theory; when price increases, demand decreases.

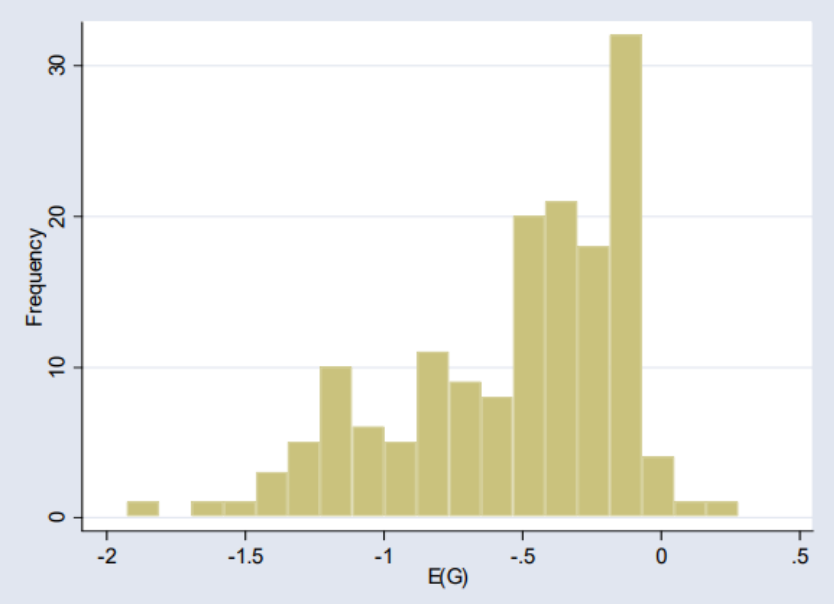
For our conduct parameter, we will take the price elasticity of demand using equation 3, which is -0.283.

Table 5.2.4: Price elasticities of demand

Model	Top 8	By Group	Whole
Model 1	-0.576	-0.194	-0.214
Model 2	-0.662	-0.264	-0.285
Model 3	-0.658	-0.263	-0.283

A meta-analysis of the price elasticity of gasoline demand by Brons et al (2008) shows the distribution of the elasticity according to 43 primary studies:

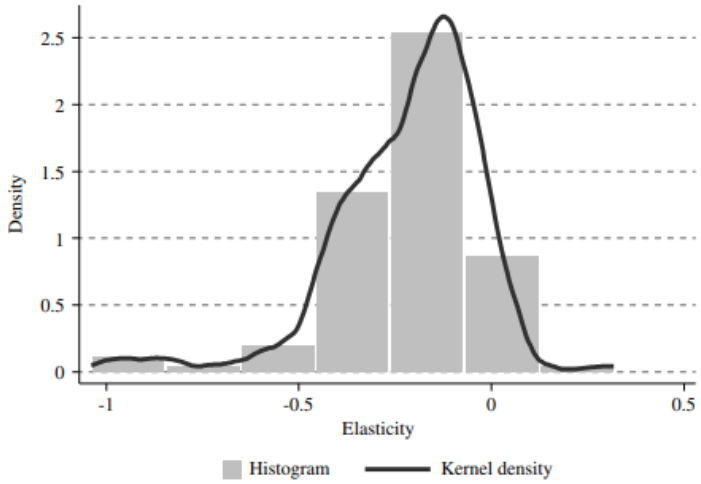
Figure 5.2.1: Distribution of the price elasticity of gasoline demand (Brons et al. 2008)



According to Brons' study, our elasticities fall within the reasonable range of -0.194 to -0.662.

Our result is also consistent with another meta-analysis study in Latin America by Galindo et al. (2015), where the distribution of the price elasticity of the gasoline demand is as follows:

Figure 5.2.2: Distribution of the price elasticity of gasoline demand (Galindo et al. 2015)



5.3. Evolution of the conduct parameters

Figure 5.3.3: Evolution of the market conduct parameter, 2016-2021

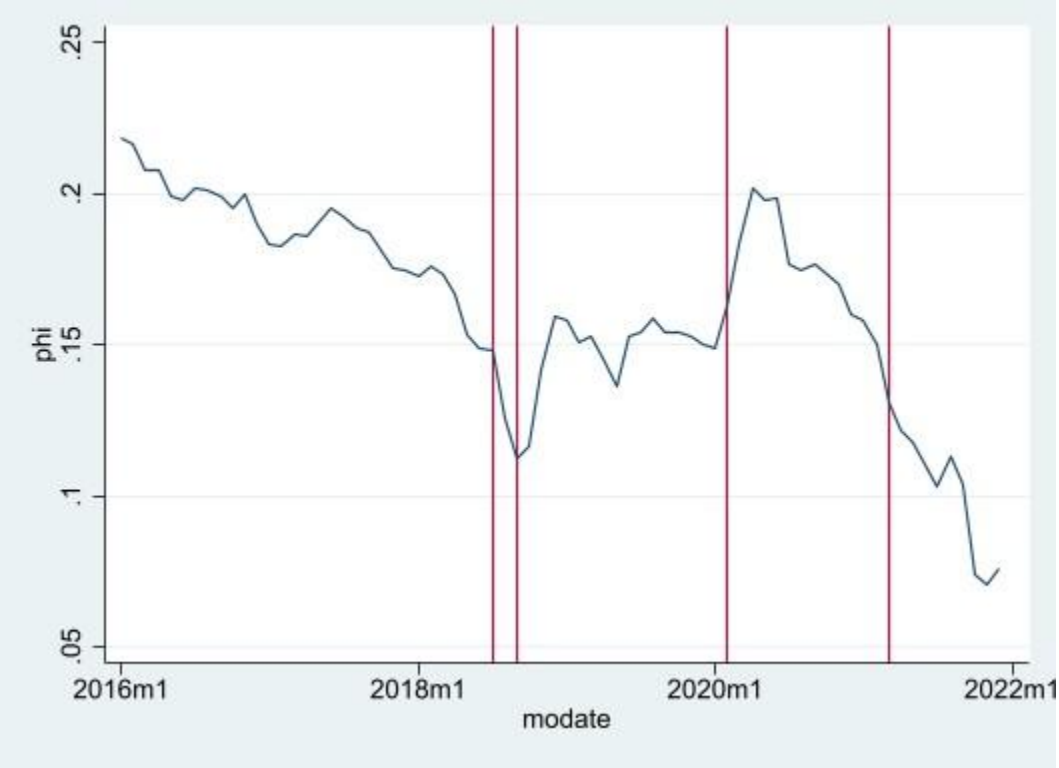


Figure 5.1 and 5.2 in the Appendix shows the evolution of conduct parameter for individual top 8 firms and also by group. In Figure 5.1, we see the evolution of the conduct parameter for the whole industry which is similar to the results in the two previous figures. In the figures, the four lines represent some significant events:

- In July 2018, the TCA started to investigate the fuel oil market, specifically for the top 8 distributors. This involves on-the-spot investigation.
- In September 2018, the preliminary investigation report was sent to the defendants, which mentioned that they are investigating for resale price maintenance.
- In February 2020, the TCA adopts its final decision, which includes a record fine of TRY 1,5 billion on OPET, BP, PO and SHELL.
- In March 2021, the EMRA decided to conduct a price intervention into the market. The EMRA has authority to intervene in the fuel oil market in situations

where "*agreements and actions that are aimed at hindering, disrupting, or restricting market activities or competition in the market, or that results in or may result in this effect, have disruptive effects on the market organization*".

The market conduct parameter ϕ for Cournot competition is 1/N, in our case we have an average of 27 distributors in the market during the observation years. Therefore, the Cournot conduct parameter benchmark ϕ_c is 0.037.

In our estimation, for all of the months from 2016 to 2021, the conduct parameters are higher than the fully competitive benchmark and the Cournot benchmark. Although ϕ is not high enough for the market to be in full collusion, we can still observe how the competitiveness in the market changes over time.

It should be noted that when the July 2018 investigation started, the distributors operating in the market decreased the retail price of gasoline significantly. As a result of that, their margin decreased too. However, after TCA sent the preliminary investigation report to the parties in September 2018, stating that they are being investigated for resale price maintenance, they again started to increase their mark-ups, hence the conduct parameter increases.

In our opinion the on the spot inspection which took place in July 2018 covered the whole market and the market players do not have any idea what was the main aim of investigation whether it is related to agreements among the firms or not. As a result of that they suddenly decreased the retail price of fuels with the shock of investigation. Finally, after the preliminary report delivered to the parties they understood the investigation was related to the resale price maintenance which is mainly related to each individual firm, then they increased their margins again. It should be noted that even though the investigation seems to cover the top 8 distributors, each decision was given individually.

The third vertical line represents the final decision of TCA which the authority decided to fine OPET, BP, PO and SHELL. After the decision it seems that in the market markup of the firms started to increase for a short period of time, before it decreased again.

It also seems after the EMRA's decision in March 2021 the markups in the diesel market decreased significantly. The markups of the firms seem to start decreasing before this date decision, and in our opinion this is the result of the statement from the EMRA's president which took place at the beginning of January 2021 that it would intervene in the retail prices. Towards the end of 2021, the conduct in the market is approaching ϕ_c.

6. Conclusion

Over time, the competitiveness in the Istanbul diesel market has changed. These changes have been attributed to some of the key decisions by the EMRA and TCA decisions. Although the market conduct is not in full collusion, we can observe how the conduct parameter decreases after the market intervention, towards the Cournot benchmark.

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8. Appendices

Table 5.2.1: Demand estimation of Istanbul diesel market 2016-2021, panel monthly data of individual top 8 firms

	(1)	(2)	(3)
	lnq	lnq	lnq
lnp	-0.576***	-0.662***	-0.658***
	(-7.92)	(-8.86)	(-8.80)
seas1		-0.199**	
		(-2.74)	
seas2		-0.301***	
		(-4.14)	
seas3		-0.101	
		(-1.38)	
seas4		-0.232**	
		(-3.18)	
seas5		-0.218**	
		(-3.00)	
seas6		-0.109	
		(-1.51)	

seas7	-0.0612	
	(-0.85)	
seas8	-0.0831	
	(-1.15)	
seas9	-0.0867	
	(-1.20)	
seas10	-0.0163	
	(-0.23)	
seas11	-0.0373	
	(-0.52)	
q1		-0.182***
		(-4.25)
q2		-0.168***
		(-3.95)
q3		-0.0587
		(-1.40)

_cons	10.72***	10.99***	10.96***
	(20.08)	(20.38)	(20.42)
N	576	576	576

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5.2.2: Demand estimation of Istanbul diesel market 2016-2021, panel monthly data of each group

	(1)	(2)	(3)
	lnq	lnq	lnq
lnp	-0.194***	-0.264***	-0.263***
	(-3.84)	(-5.52)	(-5.41)
seas1		-0.187***	
		(-3.99)	
seas2		-0.185***	
		(-3.97)	
seas3		-0.0877	

	(-1.87)
seas4	-0.179***
	(-3.82)
seas5	-0.171***
	(-3.66)
seas6	-0.0650
	(-1.40)
seas7	-0.0106
	(-0.23)
seas8	-0.0238
	(-0.51)

seas9	-0.0511	
	(-1.10)	
seas10	0.0106	
	(0.23)	
seas11	-0.0138	
	(-0.30)	
q1		-0.152***
		(-5.46)
q2		-0.137***
		(-4.96)

q3			-0.0273
			(-1.00)
_cons	12.12***	12.32***	12.32***
	(17.36)	(17.63)	(17.64)
N	216	216	216

Table 5.2.3: Demand estimation of Istanbul diesel market 2016-2021, time series for the whole market

	(1)	(2)	(3)
	lnq	lnq	lnq
lnp	-0.214*	-0.285***	-0.283***
	(-2.43)	(-3.51)	(-3.39)
seas1		-0.190*	
		(-2.40)	

seas2	-0.189*
	(-2.39)
seas3	-0.0914
	(-1.15)
seas4	-0.180*
	(-2.27)
seas5	-0.168*
	(-2.12)
seas6	-0.0716
	(-0.91)
seas7	-0.0109

	(-0.14)	
seas8	-0.0257	
	(-0.33)	
seas9	-0.0531	
	(-0.68)	
seas10	0.00878	
	(0.11)	
seas11	-0.0130	
	(-0.17)	
q1		-0.155**
		(-3.24)

q2			-0.138**
			(-2.91)
q3			-0.0283
			(-0.60)
_cons	12.91***	13.11***	13.11***
	(85.98)	(83.06)	(85.74)
N	72	72	72

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Figure 5.3.1: Evolution of the conduct parameter for each top 8 firms, 2016-2021

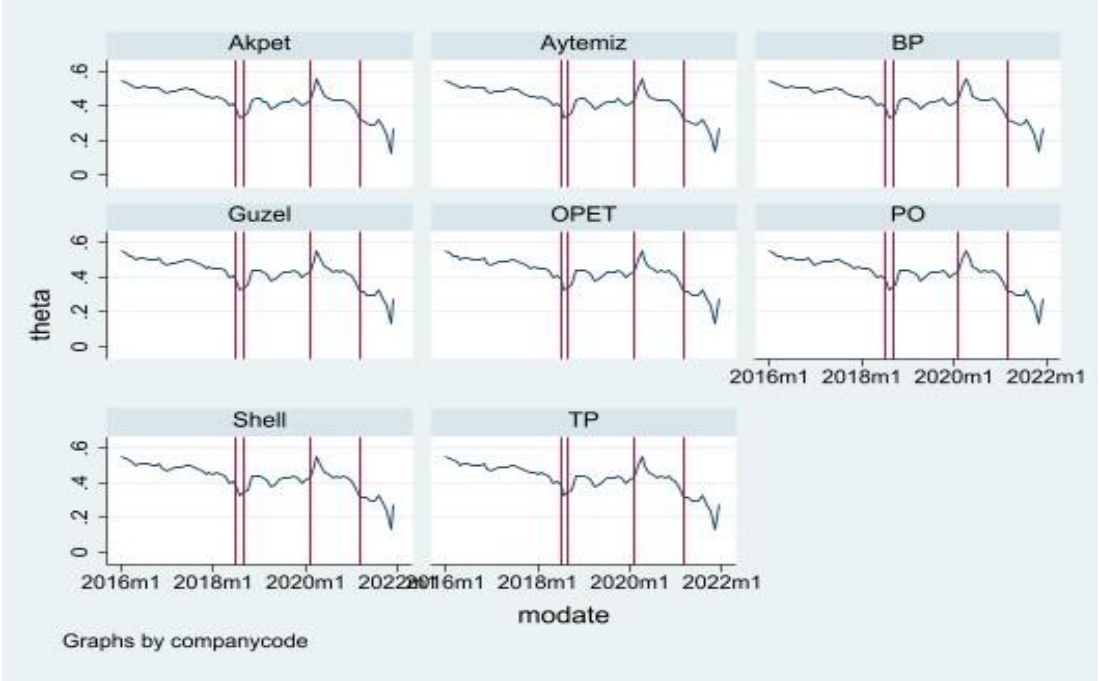

Figure 5.3.2: Evolution of the conduct parameter for each group, 2016-2021