

Market Structure and Price-Cost Margins in European Retail Gasoline Industry

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Abstract

Purpose: The purpose of this study was to investigate the influence of market structure and market conduct characteristics (such as market concentration, presence of networks operated by global corporations, presence of vertically integrated companies, presence of hypermarket gasoline stations and consumption level) on price-cost margin levels, based on an example of the European Union retail gasoline market.

Methodology: The research applied regression analysis on a panel data set comprising of average monthly price-cost margins for 2012 to 2015, based on the data published in the European Commission Oil Bulletin, and on a set of variables characterizing market structure and market conduct of 24 European Union member state countries.

Findings: The results showed that in the case of retail gasoline markets, higher industrial concentration yields higher price-cost margins with a statistically significant influence of other market structure and conduct factors.

Keywords: market concentration, Price-Cost Margin, retail gasoline sector, structure-conduct-performance

JEL: L11, L8, L13

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Introduction

The debate on the factors that influence a firm's profitability has been a key subject in the literature, pointing to the market concentration role and a firm's market share influence. At the same time, a positive correlation between concentration and profits seems to be aligned with the model of perfect competition. Empirical evidence of concentration-price studies has suggested that industries with high market concentration are provided with high profitability levels.

In the industrial organization literature, the underlying theory explaining the firm performance is focused on the influence of the conduct of the firms within the boundaries of this industry. In turn, this factor depends on the structure of the market (e.g., concentration of sellers).

In the study, the authors investigated the relationship between market structure and market conduct characteristics (such as market concentration, presence of networks operated by global corporations, presence of vertically integrated companies, presence of hypermarket gasoline stations and consumption level) and price-cost margins (referred to as PCM) based on the example of the European Union retail gasoline market. The authors aimed to investigate whether higher industrial concentration yields a higher PCM in the case of the retail gasoline market. In this article, the starting point for discussion is past research results related to the dependency between market structure and PCM. Then the choice of market structure measures used in the research is specified and justified. Finally, the results of quantitative research are used to verify the stated hypotheses.

Market concentration and price-cost margins

Industrial organization studies consider the strategic behaviour of firms and their interaction to determine the structure of markets. In an early study, Mason (1939) pointed out that the size of market players influences competitiveness in the market (expressed in supply and demand decisions related to price and production levels). Importantly, the size of the firm and the scale of its operations influences the way in which the firm responds to the market situation. Bain (1951; 1954) focused his research on the relationship between sellers' concentration and market structure and performance, showing that the average profit rate of firms in highly concentrated oligopolistic industries will be larger than in less concentrated industries. The studies by Mason and Bain contributed to development of one of the industrial organization

pillars named the Structure-Conduct-Performance paradigm. The basic idea of this paradigm is that there is a causal relationship between market structure, market conduct and market performance (Tirole, 1988). The market structure of a market is explained by supply and demand conditions. These are characterized by supplier concentration, properties of the cost function, product characteristics and elasticity of demand. These structural data determine the market behavior of companies with respect to pricing, investment and research and development. The market behavior affects the market result, which among other things can be described by profits, productivity, rate of technological progress and allocative efficiency of a market. This causal relationship is graphically illustrated in the figure below (see Figure 1).

Figure 1. Structure-Conduct-Performance Approach



Source: own illustration adapted from Tirole (1988).

Examples of the variables that define the above mentioned elements of the Structure-Conduct-Performance approach might be taken into consideration during definition, implementation and assessment of strategy, following Tirole (1988), are presented below (see Table 1).

Table 1. Examples of variables affecting Structure-Conduct-Performance

Market structure	Conduct of a company	Market performance
<ul style="list-style-type: none"> ▪ Economic characteristics of the products such as product quality, level of differentiation, and availability of substitutes, ▪ Number of sellers in the market and their concentration, ▪ Production and cost structures of companies in the market, ▪ Information about specific location and market power of buyers, ▪ Barriers to enter the market. 	<ul style="list-style-type: none"> ▪ Price, quality and quantity, ▪ Investment behavior, ▪ Advertising and marketing activities, ▪ Research and development activities. 	<ul style="list-style-type: none"> ▪ Profit margins, ▪ Resource and factor productivities, ▪ Product differentiation, ▪ Allocative efficiency of the market.

Source: prepared by author following Tirole (1988).

Hence, a typical Structure-Conduct-Performance study consists of two steps:

- 1) Collection of data to measure market performance and market structure;
- 2) Analysis of market performance and market structure using regression analysis.

A positive relationship between market structure and firm performance measures, calculated using this approach, was supported in numerous studies (Weiss, 1974; Hannan, 1991; Evans and Kessides, 1993; Davies and Downward, 1996; Fu, 2003; Resende, 2007; Tung, Lin and Wang, 2010; Dietrich and Wanzenried, 2011).

However, the Structure-Conduct-Performance paradigm has been criticized for not sufficiently explaining the relationship between market structure and market behavior along with market behavior and market performance. Generally, the model is held to be a static concept, which does not take into account that competition is a process of interaction between market structure, market conduct and market performance. These inadequacies are somehow confronted by the industrial organization approach (Sawyer, 1985).

One of the alternative approaches explaining the link between market structure and performance argued that industry structure may exist as a result of superior efficiency in production by particular players, which allows those firms to gain more market share (Peltzman, 1977; Smirlock, 1985; Evanoff and Fortier, 1988).

Industrial organization seeks to enrich this model with elements of game theory. The result is a dynamic model with reciprocal interdependencies between Structure-Conduct-Performance elements. The structures of companies, industries and markets are then no longer causes of behavioral patterns and market performance; they are rather determined by the behavior of the players in the market (Bagwell and Wolinsky, 2002).

The question of whether a company has the market power or not is easy to answer if price and marginal cost can be observed; however, data on marginal costs is available in very few cases. One way to solve this problem is to simultaneously estimate the average behavior of all companies within an industry by using a structural model (Carlton and Perloff, 2005). The main advantages of using a structural model are 1) the market power can be estimated directly and 2) it allows simulating the effects of market changes. The main disadvantage arises because the quality of the model is dependent on assumptions regarding the functional form of the demand and the technology available to each company, which are often unknown (Carlton and Perloff, 2005). Thus, most studies in this area are based on aggregate data and start from

a homogenous product, so that average market price and total output can be used to calculate. Another important assumption is that companies react in similar ways (Perloff, Karp and Golan, 2007).

The relation between market concentration and unit profitability has been the subject of multiple studies, some of which focused on a particular industry while others took a more holistic view on the economy. An overview of studies in this area is presented in Table 2.

Table 2. Chosen Studies Related To Market Concentration And PCM

Researchers	Year	Industry	Findings
Daskin and Wolken	1989	Banking	A certain critical level of market concentration exists below which PCM increase with concentration.
Ruthenberg and Elias	1996	Banking	Changes in market structure show a positive effect on margins only in the markets characterized by relatively low concentration and low entry barriers.
Go, Kamerschen and Delorme	1999	Manufacturing	Positive correlation between seller's concentration and PCM found.
Macdonald	2000	Retail	Declines in margins are related to lower market concentration, and much more severe for the markets with several competitors versus markets with limited competition.
Marsh and Brester	2004	Retail	Increases in margins are significantly affected by increased market concentration.
Dickson	2005	Manufacturing	Positive correlation between seller's concentration and PCM found.
Guevara, Maudos and Perez	2005	Banking	Increase in market concentration leads to a decrease in margins, due to the fact, that size and efficiency of business operations, affect the execution of the market power.
Yildirim and Philippatos	2007	Banking	A maximum profitability level exists, which sellers are resistant to exceed. Higher degree of competition in the market is linked with reduced margins and profitability.
Anders	2008	Retail	Increase in the level of retail concentration and the resulting market power of retailer's accounts for a significant portion of retail unit margins.

Halbersma, et. al.	2011	Healthcare	Higher concentration of hospitals drives up hospital margins, while higher concentration of insurers drives them down yet with positive result on insurers margins.
Robinson	2011	Healthcare	Hospitals in concentrated markets focus on increasing prices to private insurers while hospitals in competitive markets improve profitability by decreasing the cost base.
Shukla and Thampy	2011	Energy	Market power of firms is one of the drivers behind the increase in electricity prices.
Setiawan, Envalomatis and Lasink	2012	Manufacturing	Positive correlation between seller's concentration and PCM found.

Source: prepared by authors.

At the same time, previous studies pointed out that a positive relation between PCM and market concentration is dependent on how the margin is defined (Conyon and Machin, 1991). In addition, high market concentration does not necessarily lead to lower prices and margins. This is because in a competitive marketplace, the effectiveness of lower prices is dependent on their relative value compared to competitors. Therefore, cutting the prices (and as a result the margins) that is matched by the competitors, while the demand remains constant, generates losses for all market players. Accordingly, markets with high concentration but stable market environments may experience a sustainable cooperative behavior between the market players, therefore leading to higher margins (Green, Marshall and Marx, 2014).

Market concentration measures

Market share is the key criterion used to assess the competitiveness of a market. It helps to assess the market power, yet it is not the sole criterion deciding the dominating position. However, it allows deducing some initial conclusions with regards to the market potential of entrepreneurs and their ability to run their businesses in the market. The approach to calculation of market share differs from market to market. This allows reflecting the market position and market power of the enterprises in the most appropriate way. Thus for some markets, the leading criterion would be the number of operating companies, while for others it would be volume or revenue share.

Assessment of market concentration has been a problematic subject, especially from regulatory and anti-competitive points of view. A number of measurement criteria have been developed, including the Herfindahl-Hirschman index (HHI) and M-firm concentration rate. The prevailing challenge for these measures was the adequate assessment of market share inequality. In the following paragraphs, different concentration metrics are briefly summarized.

M-firm concentration rate (CR_m)

The CR_m index sums up the market shares of the top companies in the market and determines to what extent that group of companies controls the market. Concentration ratio is expressed by an equation, where s_i is the market share and m defines the number of firms included in the calculation of the ratio.

$$CR_m = s_1 + s_2 + \dots + s_m$$

While concentration ratio may be calculated for any number of firms (higher than zero), the most common choice is to calculate it for the four biggest firms in the industry. This means CR_4 for a market where the biggest firms hold 15%, 12%, 10% and 9% market share respectively will be equal to 46%. Interpretation of CR ratio is fairly straightforward. The lower the ratio, the more competitive the market is. In case the CR_4 equals zero, it would mean that the market is perfectly competitive as the four biggest firms would not hold even a 1% total market share. On the other hand, if the CR_1 was equal to 100%, then the industry would have a monopolistic structure with just one firm available.

Interestingly, the CR_4 rate would be the same (i.e. equal to 40%) for a different market where in the case of market A, the strongest four firms each hold a 10% market share, while in the case of market B, the strongest four firms hold 30%, 5%, 3% and 2% market shares respectively. Thus, it is crucial to note that the concentration rate does not reflect the market share inequalities between the companies in the market and focuses rather on the total market share.

Herfindahl-Hirschman index (HHI)

HHI is a measure of the size of firms operating in the market in relation to the entire industry as well as an indicator of the intensity of competition among market players (Hirschman, 1964). HHI calculation methodology is rather simple. It takes into consideration the sum of the squares of market shares of the companies operating in a given

industry. This is represented by the following formula, where s_i is the market share of firm i in the market, and N is the number of firms.

$$H = \sum_{i=1}^N s_i^2$$

Similarly to CR_m , a higher HHI signifies a less competitive industry, with an index >0.250 indicating that the market is highly concentrated (Matsumoto, Merlone and Szidarovsky, 2012). Thus, the key elements to reach the HHI for the relevant market are the market shares of the participants. For example, for market A with three companies ($N = 3$) and market shares (S) of 50%, 30% and 20% respectively, HHI would equal 38%, while for market B with three companies ($N = 3$) and market shares (S) of 35%, 35% and 30% respectively, HHI would equal 33.5%.

The influence of market share data availability has been a subject of some discussion in the literature. Authors have especially focused on reliability of the index calculated with incomplete market information (Nauenberg, Basu and Chand, 1997; Naldi and Flamini, 2014; Nauenberg, Alkhamisi and Andrijuk, 2004). Because the HHI formula focuses on the sum of squared market shares, a much lower weight is given to the companies with low market share (Calkins, 1983). Thus, after applying Zipf law, Pareto distribution and methods from combinatorics, it has been stated that the overall value of the HHI when smaller companies are accounted for does not change significantly enough to affect the overall result (Naldi and Flamini, 2014).

In the literature, it has also been pointed out that HHI adequacy relies to some extent on other explanatory variables and does not fully account for the inequality of market shares (Hannan, 1997). At the same time, it has been argued that these problems may have their roots in the industry specifics and market imperfections (Rhoades, 1995). It has also been argued that HHI is most relevant for the markets where buyers have no market power (Hendricks and McAfee, 2010). Yet a negative correlation between increase in market concentration measured by HHI and industry profits have been proved (Rhoades, 1995). The relation between HHI and price “stickiness” has also been confirmed (Leith and Malley, 2007).

HHI was adopted as the official methodology for assessing the market structure for the purpose of horizontal mergers by both the European Commission and the U.S. Federal Trade Commission. Similarly, it has been also a concentration measure most commonly used in the academic research field related to industrial concentration of various industries including gasoline refining (Rudakova, Sannikova and Shavandina, 2015),

airlines (Barla, 2000), banking (Cesari, 2000; Bikker and Haaf, 2002; Alegria and Schaeck, 2008), healthcare, manufacturing (Flath, 2011) and heavy industries (Pehlivanoglu and Tiftikcigil, 2013). Thus when interpreted properly, HHI has been found as a statistically reliable decision-making tool about business concentration (Djolov, 2013).

Due to the complexity of business life, there is no single concentration measure that can capture everything that is happening within a specific market (Curry and George, 1983; Kowka, 1985). In past academic research, the comparison between the HHI and CR has been subject to some debate. Most comparisons have pointed out the HHI superiority over the M-firm concentration rate (Nawrocki and Carter, 2010). Consequently, for low levels of concentration, non-cooperative behaviour makes little difference for industry performance. However in the case of industries where the leading firm holds a large share of the market, distinguishing the roles of the separate concentration measures is critically important to assess industry performance (Sleuwaegen and Dehandschutter, 1986). Thus, to observe differences in applying various concentration measures for the purpose of further empirical analysis, both concentration measures were used in the study.

Research methodology

While market structure seems to be linked with the equilibrium prices in the market, this relationship is far more complex and may depend on additional characteristics of firms in a market (Eckert, 2013). Consequently, based on the holistic assessment of the retail gasoline sector, the following examinable elements have been considered for the purpose of the study:

- 1) **Price-Cost Margin** in country k during period t in euros per liter (variable PCM_{kt}) was calculated as the difference between:
 - a) Average monthly retail net price in country k in euros per liter (i.e. price after deduction of excise duty, value added tax, other country specific tax levies) for unleaded 95 gasoline for 2012 to 2015 as reported in the European Commission weekly oil bulletin; and
 - b) Average monthly cost of unleaded 95 gasoline in euros per liter for 2012 to 2015 as per ARA European wholesale market³ (same value for all the

³ The market in ARA area (Amsterdam–Rotterdam–Antwerp) is considered to be the most important spot market determining gasoline prices in Europe. Yet the gasoline itself is refined in local refineries (which differ with regards to the ownership structure and production efficiency) and then delivered to the retail outlets (sometimes through an intermediary).

countries analyzed as per formula: $PCM(k, t) = \text{Average pump price}(k, t) - \text{Average cost of product}(t)$.

Given that not all countries belonged to the Eurozone area, the PCM levels valid for different countries have been calculated assuming a fixed exchange rate between the local currency and the euro (valid as of the first week of 2012).

- 2) **Market concentration**⁴ in country k in % (variables HHI_{4k} , and CR_{4k}) was expressed in HHI_4 and CR_4 concentration measures, calculated for surveyed countries on the basis of data available from online sources such as the Data Monitor reports (for different countries), CBRE MarketView reports and others. When calculating the concentration ratios, an assumption was made that from 2012 to 2015, the structure of the retail fuel market in individual countries remained unchanged, which was confirmed by market data. Where disposals and acquisitions were occurring, they were related in most cases to entire networks and therefore were not affecting the market concentration.
- 3) **Gasoline station density**⁵ in country k in km^2 per gasoline station (variable $Density_k$) was defined as the average geographical space in the country served by a single gasoline station as per data used for market concentration calculation.
- 4) **Presence of networks operated by global corporations**⁶ in country k in % (variables $BrandsCR_k$, $BrandsHHI_k$) was defined as the concentration (expressed both in HHI and CR) of gasoline stations operated under brands of global corporations (i.e. Shell, BP, Lukoil, Esso, Total, Texaco, Q8) as per data used for market concentration calculation.
- 5) **Presence of vertically integrated companies**⁷ in country k in % (variables $IntegratedCR_k$, $IntegratedHHI_k$) was defined as the concentration (expressed both in HHI and CR) of gasoline stations operated by vertically integrated companies (i.e. companies which simultaneously own refinery and retail outlets

⁴ HHI and CR concentration measures were applied as variables in empirical studies related to gasoline retailing by e.g. Coloma (2002), Hastings and Gilbert (2005), Clemenz and Gugler (2006), Sen and Townley (2010), Clemenz and Gugler (2006). They argue though that using market concentration in regression studies in the context of retail gasoline markets is subject to certain deficiencies. Namely, concentration may be driven by endogenous firm outputs/revenues (performance), which in turn affects back on the market structure. Yet in the case of the European retail gasoline industry, the number of gasoline stations per capita or square km is heterogeneous, which may be influenced by socio-economical differences between different countries and in turn affects the equilibrium gasoline price level within a given country.

⁵ Barron, Taylor and Umbeck (2004) found that after excluding the influence of individual characteristics of sellers, an increase in the density of the gasoline stations network results in lower average price level.

⁶ Importance of market structure in the case of retail gasoline industry was already pointed out by Mason (1964), who noted that large oil companies are able to differentiate the product from smaller competitors and therefore sell it at a higher price.

⁷ Vertical integration within the oil industry and its effect on retail gasoline prices has been a subject of several studies in the past. Blass and Carlton (2001) suggested that observed vertical integration and separation supports retail business efficiency. Slade (1996) and Taylor (2000) set their studies in the context of principal-agent theory and confirmed that the degree of vertical control influences retail price levels.

in a given country) This may allow these companies to obtain profits from processing crude oil as per data used for market concentration calculation.

- 6) **Presence of hypermarket gasoline stations** in country k in % (variable *Hypermarkets_k*) was defined as the percentage of stations owned by hypermarkets in the country (due to where the sale of fuels is not a core business of hypermarkets). Instead, it is rather an auxiliary activity aimed on “attracting” new customers for the core business, similar to the loss leader concept, as per data used for market concentration calculation,
- 7) **Fuel consumption** in country k in million liters per gasoline station during period t (variable *Consumption_{kt}*) was defined as consumption of unleaded 95 gasoline per annum per gasoline station. Information on gasoline consumption for individual countries for 2012 to 2015 as reported in the European Commission weekly oil bulletin (available data was for 2012 to 2014), which were characterized by declining consumption. For 2015, an assumption was made that demand remained at the same level as in 2014. It was then divided by the number of gasoline refining stations in different countries as per data used for market concentration calculation.

For the study purposes, only those countries that have been member states of the European Union during the entire 2012 to 2015 study period were taken into account. Consequently, there were 27 countries, all EU member states, for which market share and average pump price data was successfully collected. The full list of countries, along with an explanation of the pump price data collection methodology applied by the respective authorities, is provided in the appendix. In the case of Malta, Luxembourg and Slovenia, the available weekly pump price level information was the maximum allowed pump prices reported by the state authorities, and therefore did not represent the actual competitive price levels in those countries.

As a result, data for 24 countries for 2012 to 2015 were collected ($N=1,152$). Since the data analyzed was cross-sectional data for 24 countries representing 48 consecutive months, it was analyzed as panel data.

For the purpose of the study, two additional assumptions were made:

- 1) Transportation and distribution costs were the same for each country⁸,

⁸ For the purpose of refining crude delivered to local refineries (differ with regards to the ownership structure and production efficiency) by different means of transport (e.g. pipelines vs. marine transport), and after the refining process, gasoline is delivered to the retail outlets (sometimes through an intermediary). Local refineries differ with regards to the ownership structure and production efficiency. Thus, applying the distance between the ARA markets and respective locations may be misleading.

- 2) All market players were given the same baseline supply conditions. Any benefits due to volume discounts or long term supply contracts were therefore excluded from the analysis.

Table 3 shows that the data is relatively heterogeneous with moderate SDs and coefficients of variation for most of the variables.

Table 3. Summary statistics

Variable	Mean	Stand dev.	Min	Max	No of obs.
PCM_{kt} (in euro per liter)	0.128	0.030	0.084	0.203	1152
HHI_4	0.116	0.050	0.023	0.229	1152
CR_4 (in %)	73.2%	16.3%	37.7%	99.8%	1152
$Density_k$ (station per km ²)	0.030	0.025	0.005	0.103	1152
$BrandsCR_k$ (in %)	27.2%	14.3%	7.3%	61.0%	1152
$IntegratedCR_k$ (in %)	29.7%	21.9%	0.0%	82.0%	1152
$BrandsHHI_k$	0.038	0.026	0.004	0.120	1152
$IntegratedHHI_k$	0.059	0.055	–	0.171	1152
$Hypermarkets_k$ (in %)	3.9%	8.5%	1.0%	42.0%	1152
$Consumption_{kt}$ (in mln liters)	0.846	0.407	0.289	1.909	1152

Source: prepared by the authors.

In the period covered in the analyses, a significant spread in HHI and CR can be observed. This means that within the analyzed group of 24 countries, there were both low-concentrated markets (where HHI_4 is below 0.100 and CR_4 is below 0.500) and highly concentrated markets (where HHI_4 is above 0.180 and CR_4 is above 0.800), as per U. S. Department of Justice and Federal Trade Commission criteria. The average PCM_{kt} indicates that during the analysis period, firms in the sector had positive price markups, while relatively low standard deviations show that the margin levels between the countries tended to be rather close. With regards to the presence of vertically integrated companies, it is possible to observe that in the case of some markets, there are no refineries present; therefore all sellers have to import the product from outside of the country.

This study tested the hypothesis that variations in market performance (defined as profitability expressed through fuel margin level) between different European Union retail gasoline markets are explained by differences in market structure and conduct of the sellers. With regards to the research objectives, the following detailed hypotheses were defined:

H1. Market performance understood as PCM level is positively related to market concentration level and presence of networks operated by global corporations.

H2. Market performance understood as PCM level is negatively related to the network density, presence of vertically integrated companies, presence of hypermarket gasoline stations and the level of fuel consumption.

H3. Market power derived from market concentration is influenced by the relative strength of top market players in relation to the rest of the market.

Results

To verify hypotheses H1, H2 and H3, a regression analysis of the PCM against various combinations of market concentration, presence of branded gasoline stations, presence of vertically integrated operators, share of gasoline stations operated by hypermarkets and fuel consumption variables was performed. The data was analyzed in the form of a balanced panel. The regression was run both in settings excluding and including country fixed effects.⁹ To reflect the fixed effects, a least squares dummy variable model (LSDV) was used. The effects of independent variables on PCM are presented in Table 4.

The variables were found to have the following relations with the level of PCM:

- Market concentration – positive;
- Station density – positive;
- Presence of networks operated by global corporations – positive;
- Presence of vertically integrated companies – negative;
- Presence of hypermarket gasoline stations – negative;
- Fuel consumption – negative.

⁹ The influence of country/regional fixed effects on the gasoline price level was tested in some past works including Hastings and Gilbert (2005), Clemenz and Gugler (2006), Deltas (2008), Burke and Nishitateno (2013), Carranza, Clark and Houde (2015). However, Clemenz and Gugler (2006) argued that in the case of Austria, the changes in econometric model accuracy resulting from including fixed effects were marginal, and therefore in their final proposal, they do not account for them.

Table 4. Results of regression analysis (LSDV)

Independent variable	Dependent variable: <i>PCMkt</i> (in Euro per liter)			
	HHI Model	HHI Model +fixed effects	CR Model	CR Model +fixed effects
Intercept	0.108*** (0.005)	-0.054** (0.027)	0.056*** (0.008)	-0.056* (0.030)
<i>HHI4k</i>	0.463*** (0.034)	1.409*** (0.167)		
<i>CR4k</i> (in %)			0.165*** (0.012)	0.031*** (0.030)
<i>Densityk</i> (station per km ²)	0.381*** (0.069)	1.686*** (0.207)	0.505*** (0.101)	1.444*** (0.282)
<i>BrandsCRk</i> (in %)			-0.005 (0.017)	-0.078 (0.070)
<i>IntegratedCRk</i> (in %)			-0.012*** (0.007)	-0.054 (0.034)
<i>BrandsHHIk</i> (in %)	0.196** (0.077)	-1.098*** (0.332)		
<i>IntegratedHHIk</i> (in %)	-0.167*** (0.028)	-0.424*** (0.096)		
<i>Hypermarketsk</i> (in %)	-0.113*** (0.022)	-0.377*** (0.120)	-0.056*** (0.019)	-0.147** (0.072)
<i>Consumptionkt</i> (in mln liters)	-0.027*** (0.003)	0.053*** (0.019)	-0.024*** (0.003)	-0.002 (0.020)
R ²	0.335	0.419	0.321	0.419
SE	0.055	0.043	0.055	0.043
F-stat	***	***	***	***

Notes: Values of SE are given within parentheses.

*, ** and *** denote statistical significance (P-value) at the 5%, 1% and 0.1 % levels respectively.

Source: prepared by the authors.

The results suggest that industrial concentration has a statistically significant effect on the PCM for all model specifications considered. As expected, higher market concentration drives a higher PCM for the firms operating in the market. While the influence

of market concentration on PCM was confirmed, it is seen that when applying the HHI measure of concentration, other variables such as presence of branded stations and presence of vertically integrated players become statistically significant (which is not the case for the CR_m measure).

With regards to the presence of networks operated by global corporations, as expected, an increase in gasoline stations share operated by global corporations is associated with higher level of PCM (see HHI model). As already mentioned, this variable is statistically significant only when accompanied by the HHI concentration measure. Therefore, hypothesis H1 was confirmed. Interestingly, once the country fixed effects are included in the regression presence of branded gasoline stations, it leads to a lower PCM, which potentially could be explained by economics of scale and more competitive cost structures of branded players.

Contrary to expectations, an increase in gasoline station density resulted in higher average PCM (in all model specifications). While an increased density of gasoline stations could lead to a more competitive market and fierce price competition between different players, it may as well lead to higher unit profit level that has to compensate for a lower customer base. At the same time, the presence of vertically integrated operators led to a decrease in market PCM levels in every model setting. This may be due to the possibility to differentiated revenue streams by these operators that own refineries (through refinery related profits). Statistical significance of this variable depends on the HHI method used in the market concentration assessment.

The negative coefficient can be observed as statistically significant for all models specified in the case of presence of gasoline stations operated by hypermarkets. This confirms earlier studies that the number of hypermarket gasoline stations (i.e. low-cost model stations where fuel retailing is an auxiliary activity) leads to a decrease in margin levels in the country (Bruzikas and Soetevent, 2014). Similarly, an increase in consumption level leads to an economies of scale effect and lower total average cost per unit, thereby decreasing the unit margin need for the operators. However, this is not a case for the HHI model with country fixed effects, where the increase in consumption level is showing a positive influence on PCM level. Consequently, hypothesis H2 was only partially confirmed.

Interestingly, when the CR_4 market concentration measure is applied, the statistical significance of the remaining variables is drastically decreased. This may be mostly because the least square method of HHI calculation assigns more market influence to the top companies in the industry, while the CR method does not reflect the distribution

of market share within the group. Thus, HHI measure seems to be more relevant for the retail gasoline market as it reflects the market power of top players in relation to the rest of the market. Therefore, this confirms hypothesis H3.

The HHI model with country fixed effects explained 41.9% of variances concerning the level of PCM across different countries ($R^2 = 0.419$). Standard deviation of the residual component (S.E. of regression = 0.043) means that the average deviation of theoretical PCM from the empirical PCM amounts to ± 0.043 euro per liter. It is caused by the influence of factors that were not taken into account in the model. In the abovementioned model, all parameters connected with independent variables are statistically significantly different from zero at the 0.1% or 1% levels. The total statistical significance of parameters in the model was confirmed by means of the Fischer test, for which the empirical significance level amounts to 0.000.

It should also be noted that there are certain limitations to the study, resulting from the nature of the research:

- The study covers only unleaded 95 gasoline, which means that the observations may be different for diesel fuel. However, the choice of this product was the intention of the authors who wished to focus on the retail side of the market, while a significant share of diesel is sold through the B2B channel.
- The study does not account for the border traffic between certain countries, which may have some impact on the overall gasoline price level in the country.
- While market structure and the intensity of competition is claimed to influence the profitability of industries, the literature also points to the role of the heterogeneity of the seller's offer, with market structure being a result of the higher performance capacity of individual companies.

The heterogeneity of seller offers and customer perceived value (in the case of the retail gasoline industry) seem to offer a wide field for future empirical investigation that would lead to a further and better understanding of PCM level and related decisions in various industries.

Summary

The study results confirm that firms in the EU retail gasoline sector benefit from the oligopolistic market structure. This supports the findings of prior studies discussed in this article, which found a positive influence of market concentration on the PCM.

At the same time, the study shows that the effect of market concentration and market power depend on the distribution of relative market share between the top market players, not just on their total market share. In addition, while market concentration is an important predictor of PCM level, other elements of market structure and conduct are equally important and simultaneously influence the market performance. While ensuring profitability and financial health of the entities operating in the market is a baseline for engaging in a business activity, the market concentration and its effect on the price to the customer should be carefully observed by the anti-trust agencies.

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