CHAPTER 6

Connected Corporate Networks II: A Novel Approach to the Competition Measure

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6.1 Introduction

In recent decades, competition between companies is considered a major element of a well-functioning economy. Over the past years, it has been well documented in literature that market competition favors investment and innovation (Trèsor-Economics, 2008) and at the same time

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P. E. Petrakis (ed.), *Interconnections in the Greek Economy*, The Political Economy of Greek Growth up to 2030,
https://doi.org/10.1007/978-3-031-31335-6_6

ensures consumer well-being. Historical data proves that lack of competition entails political implications, from anti-trust to monetary policy and income redistribution. In the previous chapter, the telecommunications industry was analyzed in the light of the business network. The industry analysis is based on the theorem that the existence of connections between executives and companies affects the performance and policymaking of each company that belongs to the business network. Network theory introduces mathematical concepts (e.g., Betweenness—Eigenvector centrality, diameter) in industry analysis, making measurable the influence of companies (nodes) on their network. The existing corporate groups (Vodafone, Wind, Forthnet, OTE) were utilized for the modeling of the network. Corporate groups are created when one company (parent) holds at least 51% of the capital of another company (subsidiary). A group's subsidiaries are considered a business unit, insofar as they operate as a single entity through a common source of control.

Business relationships are based fundamentally on trust. In-market transactions are based on a broad form of voluntary cooperation between business units, which provides mutual benefits. In addition, collaborations are governed by a variety of institutional forms, such as anti-trust and sectoral regulations, which reflect political, historical, and cultural factors. The management of a business unit (company or group) bestows a higher level of confidence in its future, imposing its hierarchical and corporate policies on those who become members of its team. Collaborations with third parties are not necessarily permanent and mutual trust must be established in order not to take advantage of the information obtained during the cooperation.

The business network of the telecommunications market consists of a connected component, i.e., there is at least one path that connects all the nodes of the network. The nodes—companies are connected either through collaborations in third companies (Telegnous, Victus) or through joint executives (Klonis, Mazarakis). This chapter will present a comparative assessment of the our methodology in six additional sectors (Oil Refining, Metallurgy, Air Transport, Publishing, Manufacture of Tobacco

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Products and Short Sea Shipping) that do not have such a cohesive network, nor trends in cooperation between industry groups.

The traditional example of industrial organization argues that market structure is directly related to market behavior and that their interaction also determines market performance (Peterson, 1980, pp. 22–36). These interfaces express competition and monopoly. Competition between companies is a central element of a well-functioning economy.

Measuring the degree of competition in a market is extremely difficult. The most widely used indicators of the degree of competition are the concentration ratios, e.g., the Herfindahl–Hirschman index (HH) and the concentration ratio (CR). These indices are inversely proportional to the market competition, thus the higher the value, the less competitive and monopolistic the market is. Although HH and CR indicators manage to capture a significant portion of the concentration of a market, they are not sufficient to measure market power considering macroeconomic variables over time.

This study proposes a new anti-trust measure based on the CR and HH indices as they are applicable to the corporate network. Companies that are subsidiaries of a group are considered as a business unit, given that they operate as a single entity through a common source of control. The proposed index evaluates the position of each business unit in terms of turnover plus its position in the corporate network. The position of a business unit in the corporate network is evaluated in terms of its ownership and management relations with third-party business units.

In the following Sect. 6.2, this chapter provides a comprehensive overview of the current state of the business concentration and how it is measured through a thorough literature review. The methodology Sect. 6.3 details the new proposed index for measuring corporate network interconnections. The empirical results in Sect. 6.4 present the findings of the study based on the application of the new proposed concentration index and the discussion Sect. 6.5 delves into the implications of the results and how they contribute to the connected corporate networks. Overall, this chapter aims to offer a comprehensive and up-to-date understanding of the competition measures at hand, and the insights gained through this research will be valuable to researchers, practitioners, and policymakers alike.

6.2 Literature Review

The degree of competition, also known as the degree of concentration, is a critical variable for employment, investment, and economic growth. Many studies argue that low concentration (competition) in a market leads to economic growth, creates a favorable environment for investment, drives businesses to innovation, and creates jobs (Trésor-Economics, 2008). At the same time, ensuring the well-being of consumers depends on the degree of competition.

Many studies in the international literature (Amountzias, 2017; Polemis, 2014a, 2014b; Rezitis & Kalantzi, 2013) investigate the degree of market power of the sectors of the Greek economy, through the price–cost margin (Roeger, 1995). The above-mentioned empirical studies use the method of Hall (1988), which has its roots in the price–cost margin approach (Roeger, 1995). The price–cost margin method assumes that in case of full competition, the marginal cost will be equal to the prices. When equality between prices and marginal costs does not apply, then the market structure is not competitive, in other words the focus is on the range of the mark up.

In addition, indicators are frequently used to measure the degree of competition, such as the concentration ratio $CR(r)$ and the Herfindahl–Hirschman index (HH). The concentration ratio is the sum of the market shares of the largest companies in the market, while the HH index is equal to the sum of the total squares of the market shares. The concentration ratio is calculated as:

$$CR(r) = \sum_{i=1}^{r} \frac{x_i}{X}$$

where x_i is the value of the sales of the enterprise i and r is the total number of enterprises in the market, and X is the total turnover of the total set of enterprises in the market. The higher the market concentration, the less intense is the competition in the market. It should be noted that the concentration ratio provides limited information on the structure of shares between companies in the industry, i.e., the degree of inequality of sales shares.

The Herfindahl–Hirschman (HH) index is often used in empirical research to measure the level of competition in an industry. More specifically, the HH index is a measure of the degree of concentration of sales

of companies in each market. This index uses the turnover shares of the companies and is (then?) subtracted from the sum of the squares of the sales shares of all the companies.

The HH index is based on the following formula:

$$HH = \sum_{i=1}^{r} s_1^2 = \sum_{i=1}^{r} \left(\frac{x_i}{X}\right)^2$$

where x_i is the sales value of i company, $i = 1, 2, 3, \ldots,$ r are the businesses in the industry, and X are the total sales of the industry/market in question.

From the two measures, HH seems to be the more generally preferred in terms of its properties. This is because the HH index has a strong advantage over $CR(r)$ indicators, as it could reflect both the average size of the business and the size inequality between companies.

In 1968, the concentration rate was used in the first merger guidelines, and later, in the 2010 horizontal merger guidelines, the HH index was used as a screening tool for potential anti-trust concerns raised by a proposed merger (Kvålseth, 2018).

$CR(r)$ and HH are different so that no functional relationship can exist between them. This notwithstanding, it would be informative to approximate relationships if bounds and inequalities between the measures can be derived (Kvålseth, 2018). Such research was done by Pautler, Kwoka, and Sleuwaegen et al., in which they obtain bounds on HH in terms of $CR(r)$. Their work was a response to the change in the U.S. merger guidelines, replacing the four-firm concentration ratio $CR(4)$ with the HH index. Results showed that the absolute variation in values of HH increased greatly with an increasing CR4. Regarding these early explorations of potential HH-$CR(4)$ relationships, there doesn't seem to be any record of an attempt to verify, correct, or expand on these results (Kvålseth, 2018).

Kvålseth (2018) takes another critical look at those earlier findings using a more rigorous and transparent approach, resulting in some corrections or modifications and alternative formulations. The analytic approach used is that of majorization theory supported by data from computer simulation, generating random market-share distributions.

Kwoka used a statistical model using regression analysis to determine the "best" function to describe the relationship between HH and $CR(r)$

(or vice versa). Such analysis is performed for real or simulated market-share data. Kwoka reported this effort by relating the logarithm $logCR_m$ linearly to $logHH$ for $r = 2$ and $r = 4$ and obtained quite a good fit to real market-share data. More recently, Pavic et al. fitted real data to a model in which CR4 is expressed as a power function of HH. Those authors fitted market-share data at different levels of aggregation and also obtained good model fits.

By contrast, instead of using a function that aims to relate each value of HH to an approximate single value of $CR(r)$ or vice versa, Kvålseth uses majorization theory to develop bounds that can in turn be used to approximately relate one measure to another. This approach also provides tolerance or error limits within which the value of HH must lie given any particular value of $CR(r)$ and vice versa.

In recent bibliography, Bukvic (2019) analyzes the degree of concentration and competition in the Serbian banking sector during the 2010–2017 period and in its current state, by considering the financial statements of banks for the years 2016 and 2017. For this purpose, both traditional concentration indicators (concentration ratio $CR(r)$ and the Herfindahl–Hirschman index), and the rarely used Linda indices have been used. Bukvic has demonstrated that in the current case of a relatively large number of banks operating in Serbia, the existing degree of concentration is relatively low. This provides suitable conditions for the development of healthy competition among them. However, the approximation of the indices to moderate concentration within the period analyzed, warns of the appearance of an oligopoly.

A study by Kostić (2009) provides and promotes many indices that could be used for measuring the market power of companies. Anti-trust policymakers often rely on the calculated values of these indicators to make important decisions regarding the appearance of certain economic entities in the relevant market. They enable the analysis of the current market situation, considering the changes that are happening in it, and they are also used to predict and analyze future market trends (Kostić, 2009).

Concentration indices are subject to changes which those economic entities go through, and they are related to their market share in the relevant market. Therefore, under these changes, the value of the concentration index also changes. For the concentration indices to be comparable

between different branches and periods, they are often subject to appropriate mathematical operations to reduce their value in the interval from 0 to 1 (Veselinović & Radukić, 2021).

In general, the restrictions on competition in the market depend on market participants and the distribution of market share, sales, revenue, region, and resources in one market, but also the availability of data (Veselinović & Radukić, 2021). If the level of concentration is methodologically accurate, then, the difference in the size of market share between all companies in the relevant market is accurate and the picture of the level of competition restrictions in the relevant market can be much clearer (Veselinović & Radukić, 2021). Thus, further decisions could be substantiated regarding the strengthening of competitive relations.

6.3 Methodology

The new index revises and recalculates the industry concentration ratio (CR) based on the common entities (nodes) of the network. Each entity—node is evaluated based on its position in the network and its interfaces. The innovation of the new index is the additional multiplier (M) to the algorithm, which evaluates the company's position in the network and increases or decreases the CR value. To calculate the new index, the following steps are followed:

Step 1: Locate the entities from the business network that are related to the company in question.

Step 2: Calculate the concentration ratio (CR) of the common entities according to the formula previously analyzed.

Step 3: To calculate the multiplier, four categories of criteria are considered, and the weights are defined.

$$M = \left(\text{weight}_1 \times \text{score}_1 + \text{weight}_2 \times \text{score}_2 + \text{weight}_3 \times \text{score}_3\right) + \left(\text{weight}_4 \times \text{score}_4\right)/10^5$$

where weight values are presented in Table 6.1.

6.3.1 *Management Positions in Related Entities*

Each management relationship (Table 6.2) between the examined node and the entities/groups of the industry is evaluated and a score is

Table 6.1 Weight values per category

Category	*Description*	*Weight*
Management positions in related entities	The node is connected with affiliated entities/groups	30
Ownership relations in related entities	The node has ownership relationship with affiliated entities/groups	30
Distance in the business network	The level of connection within connected entities	20
Turnover of the connected business entity	Turnover of the node as a percentage of the total turnover of the sector	20

Source Author's calculations

Table 6.2 Scoring values based on their role

Role	*Score*
CEO	100
President	80
Vice president	70
Executive member	50
Non-Executive member	30
Combined (e.g., President & CEO)	Hierarchical selection

Source Author's calculations

obtained which corresponds to the importance of its role in the management of the company. In case there is no management relationship, the score equals zero, while in cases of more than one role, the one with the highest score prevails.

6.3.2 Ownership Relations in Related Entities

The ownership relations of the examined node with the industry are evaluated based on the percentage of capital holding. For each unit of capital of the examined node held by an entity, a point is added to the score, e.g., for 70% holding of the capital, the node is evaluated with 70 points.

Table 6.3 Scoring values based on the level of relationship

Level	*Score*
level 1	100
level 2	50
level 3	25

Source Author's calculations

6.3.3 *Distance in the Business Network*

The analysis of the corporate network is performed at three levels (Table 6.3). The first level implies a direct relationship between two entities, i.e., a node actively participates in the administration or ownership of the other. At the second level, there is a node between the examined entities, i.e., there is a direct relationship with the entity of the first level. At the third level, there are two nodes between the examined entities.

6.3.4 *Turnover of the Connected Business Entity*

The turnover of the node is calculated in terms of the percentage that participates in the total turnover of the branch. The higher the participation rate in the total turnover, the greater the influence the node has on the industry (Table 6.4).

Step 4: Following the calculation of the multiplier, the CR of the common entities is re-calculated. The added value which results from the relationship of the examined entity with its business network is fully identified.

$$\text{Addedvalue} = \text{Multiplier} \times \text{CR}(\text{commonentities})$$

Table 6.4 Scoring values based on the percentage of participation

Percentage	*Score*
up to 1%	10
1–10	
…	
> 20%	100

Source Author's calculations

Step 5: The algorithm is completed by calculating the revised CR.

$$\text{AdjustedCR(commonentities)} = \text{Addedvalue} + \text{CR(commonentities)}$$

Step 6: Each common entity contributes proportionally to CR. Therefore, the percentage of the value added for each entity is estimated and, thus, the revised CR is calculated for each entity, respectively.

$$\text{Addedvalueshare} = (\text{CR(entity)}/\text{CR(commonentities)}) * \text{Addedvalue}$$

$$\text{AdjustedCR(entity)} = \text{CR(entity)} + \text{Addedsharedvalue}$$

6.4 Empirical Results

6.4.1 Telecommunications Sector

For the empirical application of the revised CR, this study initially examines the company Telegnous Private Company from the telecommunications sector. According to the traditional methodology, the distribution of CR based on the financial results of 2019 is presented in Table 6.5.

According to the revised CR, the distribution is affected by the relationship of the examined company (Telegnous) within its business network. Table 6.6 presents the input data for Telegnous based on the proposed methodology. Telegnous is associated with three of the four

Table 6.5 CR estimation using the traditional approach

Group (Entity)	*Concentration Rate (as of 2019) (%)*
OTE Group	58.85
WIND Group	9.48
VODAFONE Group	17.06
FORTHNET Group	4.63
Rest	9.99

Source Authors' calculations based on the Linked Business Registry statistical business register of Greece (established by Linked Business PLC, linkedbusiness.eu) defined as the set of legal entities that have been assigned with a valid identification number by the General Electronic Commercial Registry combined with a valid Tax Identification Number by the Greek Tax Register

Table 6.6 Input data for the calculation of the revised CR

Common Entity	*Telegnous (TELECOMMUNICATIONS SOLVENCY ASSESSMENT AGENCY Private Company)*
Involved Entities	*OTE Group, WIND Group, VODAFONE Group*
Management positions in related entities	none
Ownership relations in related entities	100%
Distance in the business network	level 1
Turnover of the connected business entity	up to 1%

Source Author's calculations

groups in the telecommunications sector, namely OTE, WIND, and Vodafone. The groups collectively own 100% of the company; however, there is no management relationship between groups and the company, given that none of the management members are shared. The company is directly connected to the groups and is not mediated by another entity; therefore, the relationship is at the first level of the network. Finally, the turnover of Telegnous for the financial year 2019 was 241.84 K, amount that corresponds to a percentage of 0.004% of the total turnover of the sector for that particular year.

The updated distribution based on the revised CR is presented in Table 6.7.

The CR of the entities associated with Telegnous (OTE, WIND, VODAFONE) is 85.38%. Following the methodology for the calculation of the revised CR applied to Table 6.6, we calculate the multiplier which will define the added value resulting from the relationship of the groups with Telegnous. Table 6.7 presents the added value from this relationship which stands at 4.44%, formulating (bringing?) the revised CR of the three groups to 89.82%. Each entity is affected to a different level and has a distinctive percentage of added value. In other words, the revised CR should be calculated with respect to each entity (separately). Subsequently, the multiplier for OTE group comes to 3.06% while the revised CR amounts to 61.91%. Having said that, it is worth noting that, as the revised CR is calculated for all entities of the industry, in some cases the revised CR decreases respectively (accordingly). Thus, in the examined example the Forthnet group ends up with a revised CR of 3.23%.

Table 6.7 Adjusted CR distribution based on Telegnous effect

TELEGNOUS EFFECT	
CR (3) (initial)	85.38%
REST (initial)	14.62%
MULTIPLIER	0.052
ADDED VALUE	4.44%
ADJUSTED CR(3)	89.82%
ADJUSTED REST CR(3)	10.18%
Added value WIND Group	0.49%
Added value VODAFONE Group	0.89%
Added value OTE Group	3.06%
CR FORTHNET (adjusted)	3.23%
CR WIND Group (adjusted)	9.97%
CR VODAFONE Group (adjusted)	17.94%
CR OTE Group (adjusted)	61.91%
CR REST (adjusted)	6.95%

Source Author's calculations

As can be seen in Fig. 6.1, the affiliated groups (OTE, WIND and VODAFONE) are strengthened in their position while for the other participants, the revised CR is significantly decreased. The largest increase within the telecommunications sector appears in the OTE group, which is the dominant entity of the industry. By contrast, entities without any similar affiliation with Telegnous, e.g., the FORTHNET group, show a significant reduction in their revised CR, and therefore, their influence on the industry is weakened.

6.4.2 Oil Refining Sector

The oil refining sector is dominated by the ELPE and Motor Oil Groups. According to the financial data of 2019, Table 6.8 shows the estimations of the traditional CR.

The two groups have entered a partnership with Athens Airport Fuel Pipeline Company. The distribution of CR is clearly affected by this collaboration as Table 6.10 shows, according to the input data (Table 6.9).

Motor Oil and ELPE dominate 80% of the market. In addition, Motor Oil group holds 16% of the Athens Airport Fuel Pipeline, which is a private company while, at the same time, these entities share management members. Moreover, 50% of Athens Airport Fuel Pipeline belongs to the

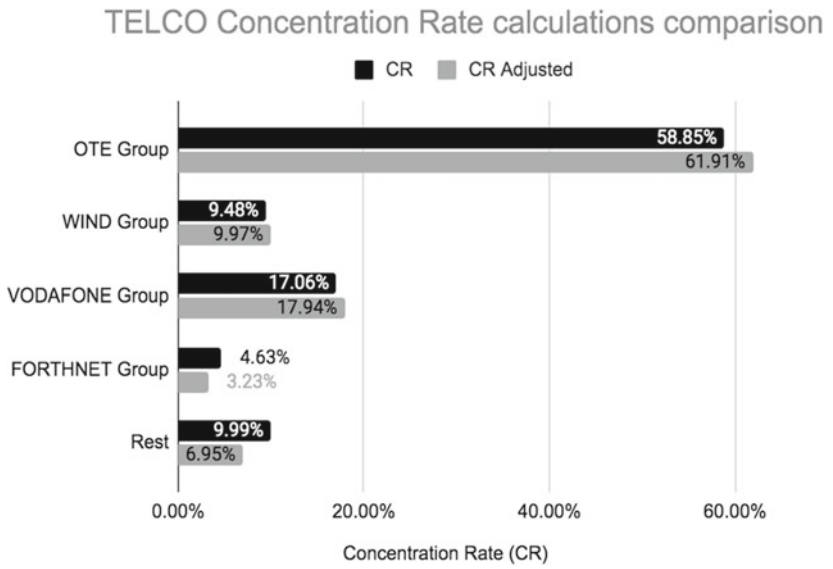

Fig. 6.1 The revised and the initial concentration rate for the Telecommunications sector

Table 6.8 CR estimation using the traditional approach

Group (Entity)	*2019 Revenue (in mm €)*	*CR (%)*
Motor Oil Group	€9,372.00	41.13
ELPE Group	€8,856.00	38.87
Rest	€4,557.00	20.00
Market total	€22,787.00	100

Source Author's calculations

ELPE group. Athens Airport Fuel Pipeline had a turnover of 4.36 m for the fiscal year 2019, corresponding to 0.02% of the total turnover of the industry.

The updated distribution based on the revised CR is presented in Table 6.10.

For the fiscal year 2019, the two groups hold 80% of the total turnover of the sector. Table 6.10 shows that an added value of 4.54% is created by the relationship between the groups and the Athens Airport Fuel Pipeline

Table 6.9 Input data for the calculation of the revised CR

Common Entity	*Athens Airport Fuel Pipeline private company*	
Involved Entities	*Motor Oil Group*	*ELPE Group*
Management positions in related entities	Executive Member	–
Ownership relations in related entities	16%	50%
Distance in the business network	level 1	
Turnover of the connected business entity	up to 1%	

Source Author's calculations

Table 6.10 Adjusted CR distribution based on the effect of the Athens Airport Fuel Pipeline

Athens Airport Fuel Pipeline	
CR (2) (initial)	80.00%
REST (initial)	20.00%
MULTIPLIER	0.0568
ADDED VALUE	4.54%
ADJUSTED CR (2)	84.54%
ADJUSTED CR (REST)	15.46%
Motor Oil Group	2.34%
ELPE Group	2.21%
Motor Oil Group (adjusted)	43.47%
ELPE Group (adjusted)	41.08%

Source Author's calculations

private company. Based on the revised CR, it is estimated that the two groups account for 84.54% of the market, while the influence of the other entities is limited to 15.46%.

Figure 6.2 represents the revised and the conventional CRs. The industry leaders (Motor Oil, ELPE) hold approximately the same market share, with a small lead by the Motor Oil group. Their relationship with the Athens Airport Fuel Pipeline private company strengthens the Motor Oil and ELPE groups by 2.34% and 2.21%, respectively, significantly reducing the market influence of other entities.

6.4.3 Metallurgical Activities Sector

Although in the Metallurgical activities sector there are no collaborations between the groups, the existence of a connection is present through

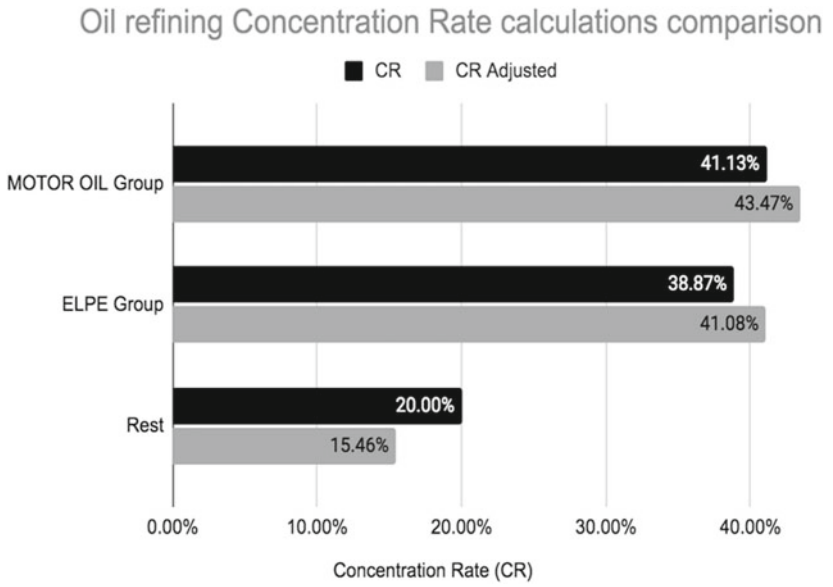

Fig. 6.2 The revised and the initial concentration rate for the Oil refining sector

other companies and members of their management. The president of the Viohalco Group, Stasinopoulos Nikolaos, has been a non-executive member of the management of the Eurobank Group together with Wade Sebastian Burton. Wade Sebastian Burton was also a non-executive member of the Mytilineos Group, creating an indirect connection with the Viohalco Group.

According to the financial data of 2019, Table 6.11 shows the estimations of the traditional CR.

The updated distribution based on the revised CR is presented in Table 6.13.

As mentioned earlier, in the minerals sector there are no collaborations either at company level or in the sharing of management members. However, the indirect relationship of the VIOHALCO and MYTILINEOS groups affects the CR of the companies. Stasinopoulos owns 32% of the shares of the VIOHALCO group performing executive duties, while in a third level of the network, a connection can be found with the

Table 6.11 CR estimation using the traditional approach

Group (Entity)	*2019 Revenue (in mm €)*	*CR (%)*
VIOHALCO Group	€4,198.00	57.72
MYTILINEOS Group	€2,256.00	31.02
HELLENIC HALYVOURGIA	€187.60	2.58
PROMETAL	€118.20	1.63
PIRAIKI METALS	€6.90	0.10
EXALCO	€117.30	1.61
Rest	€388.60	5.34
Market total	€7,273.00	100

Source Author's calculations

MYTILINEOS group; in other words, two other nodes mediate between them (Table 6.12).

The relationship between the groups is of minor importance, as is reflected in the small added value that results from it. The two-related groups (VIOHALCO, MYTILINEOS) had a cumulative CR of 88.74%, while the revised CR is 90.48%. The support rates of the other players are just as small and, in some cases, e.g., PIRAIKI Metals, negligible.

Figure 6.3 shows that the benefit of the affiliated entities is small; however, their influence in the industry was already high and there is no room for significant growth.

Table 6.12 Input data for the calculation of the revised CR

Common Entity	*Stasinopoulos N*	
Involved Entities	*VIOHALCO Group*	*MYTILINEOS Group*
Management positions in related entities	President	none
Ownership relations in related entities	32%	
Distance in the business network	level 1	level 3
Turnover of the connected business entity	–	

Source Author's calculations

Table 6.13 Adjusted CR distribution based on the Stasinopoulos effect

Stasinopoulos EFFECT	
CR (2) (initial)	88.74%
REST (initial)	13.84%
MULTIPLIER	0.0196
ADDED VALUE	1.74%
ADJUSTED CR(2)	90.48%
ADJUSTED CR (Rest)	12.10%
VIOHALCO	1.13%
MYTILINEOS	0.61%
HELLENIC HALYVOURGIA	0.32%
PROMETAL	0.32%
PIRAIKI METALS	0.01%
EXALCO	0.20%
VIOHALCO (Adjusted)	58.85%
MYTILINEOS(Adjusted)	31.63%
HELLENIC HALYVOURGIA (Adjusted)	2.90%
PROMETAL (Adjusted)	1.95%
PIRAIKI METALS (Adjusted)	0.11%
EXALCO (Adjusted)	1.82%

Source Author's calculations

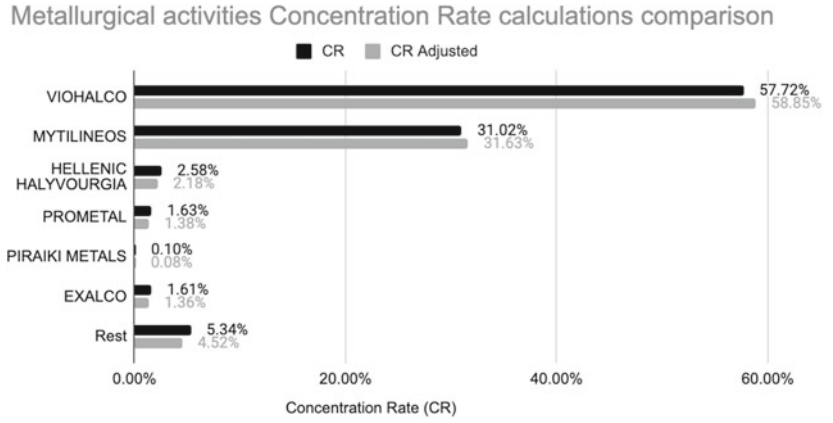

Fig. 6.3 The revised and the initial concentration rate for the Metallurgical sector

6.4.4 Publishing Sector

The industry of Newspaper and Magazines Publishing has special characteristics given the nature of information collecting, promotion, publicizing and, in general, the diffusion of news. The Kathimerini Group and Attica Media Group have jointly established a corporation (E-One) which offers online entertainment, information, and communication. Table 6.14 shows the estimations of the traditional CR, according to the 2019 fiscal year financial standings.

Kathimerini and Attica Media own 25% of the E-One company, respectively, while at the same time they share executives. In particular, Diamantopoulos Vassilis has served as CEO of E-One and Vice President of the Kathimerini group (Table 6.15).

Table 6.14 CR estimation using the traditional approach

Group (Entity)	*2019 Revenue (in mm €)*	*CR (%)*
KATHIMERINI GROUP	€39.23	19.44
ATTICA MEDIA GROUP	€28.35	14.05
Market total	€201.80	100

Source Author's calculations

Table 6.15 Input data for the calculation of the revised CR

Common Entity	*E-One*	
Involved Entities	*ATTICA MEDIA GROUP*	*KATHIMERINI GROUP*
Management positions in related entities	President	None
Ownership relations in related entities	25%	25%
Distance in the business network	level 1	level 1
Turnover of the connected business entity	–	

Source Author's calculations

Table 6.16 Adjusted CR distribution based on E-ONE effect

E-ONE EFFECT	
CR (2) (initial)	33.49%
REST (initial)	66.51%
MULTIPLIER	0.065
ADDED VALUE	2.18%
ADJUSTED CR (2)	35.67%
ADJUSTED CR (Rest)	64.33%
Added value ATTICA MEDIA GROUP	0.91%
Added value KATHIMERINI GROUP	1.26%
CR ATTICA MEDIA GROUP (Adjusted)	14.96%
CR KATHIMERINI GROUP (Adjusted)	20.79%

Source Author's calculations

The two-related groups had a cumulative CR of 33.49%, while the revised CR is 35.67%. The Kathimerini group was strengthened by 1.26%, while Attica publications by 0.91%. The recalculation of CR is presented in detail in Table 6.16.

The Figure below shows the output from Table 6.16. The benefit of the affiliated entities is significant, even though they still represent a small share of the industry (Fig. 6.4).

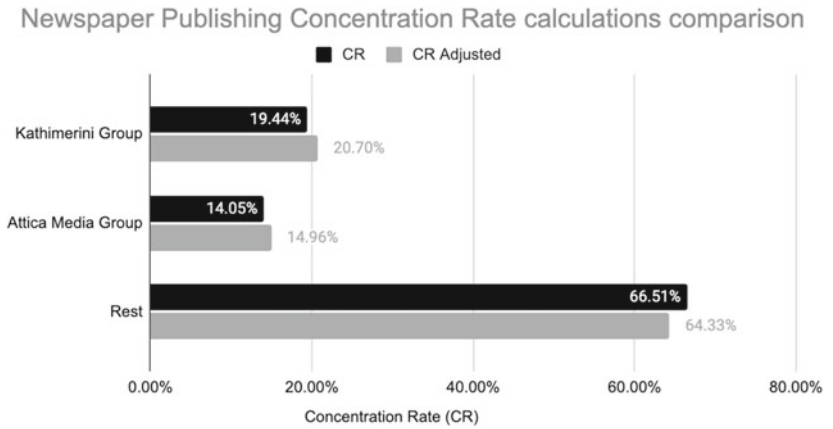

Fig. 6.4 The revised and the initial concentration rate for the Newspaper Publishing sector

6.4.5 *Manufacture of Tobacco Products*

The tobacco industry is particularly concentrated in two strong groups with excessive competition (the Papastratos Group and the Karelia Group). The sector is characterized by limited staff movement while a third smaller player (Greek Cooperative Cigarette Manufacturing Company or in short G.C.C.M./"ΣΕΚΑΠ" in Greek) has inserted itself in the sector. G.C.C.M. is interconnected with several third sectors.

According to the financial data of 2019, Table 6.17 shows the estimations of the traditional CR.

The groups have not cooperated; however, a connection can be found between the Karelia group and the G.C.C.M. (SEKAP), through the Thessaloniki Port Authority and the shared members of the Board of Directors (Table 6.18).

The two-related groups had a cumulative CR of 65.53%, while the revised CR is 66.65%. The Karelia group was strengthened by 1.06%,

Table 6.17 CR estimation using the traditional approach

Group (Entity)	*2019 Revenue (in mm €)*	*CR (%)*
PAPASTRATOS GROUP	€414.69	24.90
KARELIA GROUP	€1,035.70	62.34
G.C.C.M. (ΣΕΚΑΠ)	€52.96	3.19
Market total	€1,661.2	100

Source Author's calculations

Table 6.18 Input data for the calculation of the revised CR

Common Entity	*THESSALONIKI PORT AUTHORITY*	
Involved Entities	*G.C.C.M. (ΣΕΚΑΠ)*	*KARELIA GROUP*
Management positions in related entities	executive member	non-executive member
Ownership relations in related entities	–%	–%
Distance in the business network	level 3	level 3
Turnover of the connected business entity	–	

Source Author's calculations

Table 6.19 Adjusted CR distribution based on the effect of the THESSALONIKI PORT AUTHORITY

THESSALONIKI PORT AUTHORITY	
CR (2) (initial)	65.53%
REST (initial)	34.47%
MULTIPLIER	0.017
ADDED VALUE	1.11%
ADJUSTED CR (2)	66.65%
ADJUSTED CR (Rest)	33.35%
Added value KARELIA GROUP	1.06%
Added value G.C.C.M. (ΣΕΚΑΠ)	0.05%
CR KARELIA GROUP (Adjusted)	63.4%
CR G.C.C.M. (ΣΕΚΑΠ) (Adjusted)	3.24%
CR PAPASTRATOS GROUP (Adjusted)	24.1%

Source Author's calculations

while SEKAP by 0.05%. The recalculation of CR is presented in detail in Table 6.19.

The Figure below shows the output from Table 6.19. The benefit of affiliated entities is of minor importance, as their relationship to the joint entity is not strong, neither does it belong to the same industry (Fig. 6.5).

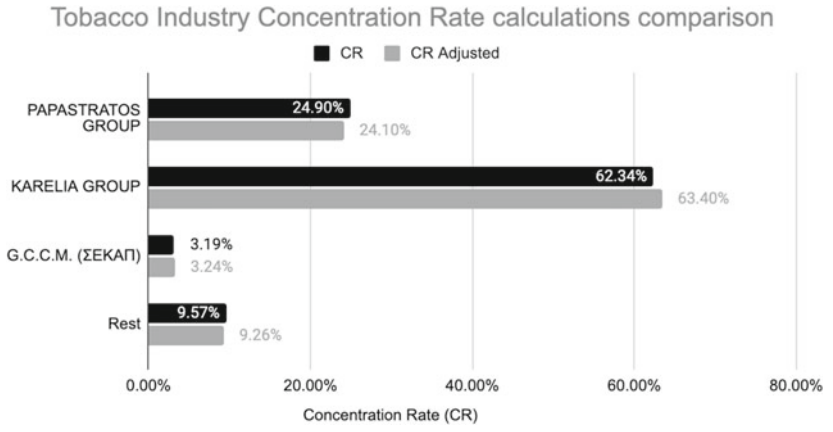

Fig. 6.5 The revised and the initial concentration rate for the Tobacco Industry

6.4.6 *Short Sea Shipping Sector*

The Sea and Coastal passenger water transport sector is highly concentrated. The three main participants (ATTICA Group, ANEK LINES Group, MINOAN LINES Group) are connected to each other, sharing executives in different levels.

According to the financial data of 2019, Table 6.20 shows the estimations of the traditional CR.

The groups have not cooperated, but a connection can be identified between them through the Vardinogiannis and Laskaridis families. The Table 6.21 analyzes the connection of the ANEK Lines and ATTICA groups.

The two-related groups had a cumulative CR of 84.22%, while the revised CR is 85.82%. The ATTICA group was strengthened by 2.77%, while ANEK LINES by 1.19%. The recalculation of CR is presented in detail in Table 6.22.

Table 6.20 CR estimation using the traditional approach

Group (Entity)	*2019 Revenue (in mm €)*	*CR (%)*
ATTICA Group	€405.40	58.94
ANEK LINES Group	€173.90	25.28
MINOAN LINES	€92.10	13.39
Market total	€687.80	100

Source Author's calculations

Table 6.21 Input data for the calculation of the revised CR

Common Entity	*VARDINOGIANNIS IOANNIS IOSIF*	
Involved Entities	*ATTICA GROUP*	*ANEK LINES GROUP*
Management positions in related entities	President	CEO
Ownership relations in related entities	–%	–%
Distance in the business network	level 1	level 1
Turnover of the connected business entity	–	

Source Author's calculations

Table 6.22 Adjusted CR distribution based on VARDINOGIANNIS IOANNIS IOSIF effect

VARDINOGIANNIS IOANNIS IOSIF	
CR (2) (initial)	84.22%
REST (initial)	15.78%
MULTIPLIER	0.047
ADDED VALUE	3.96%
ADJUSTED CR (2)	88.18%
ADJUSTED CR (Rest)	11.82%
Added value ATTICA GROUP	2.77%
Added value ANEK LINES GROUP	1.19%
CR ATTICA GROUP (Adjusted)	61.71%
CR ANEK LINES GROUP (Adjusted)	26.47%
CR MINOAN LINES (Adjusted)	10.03%

Source Author's calculations

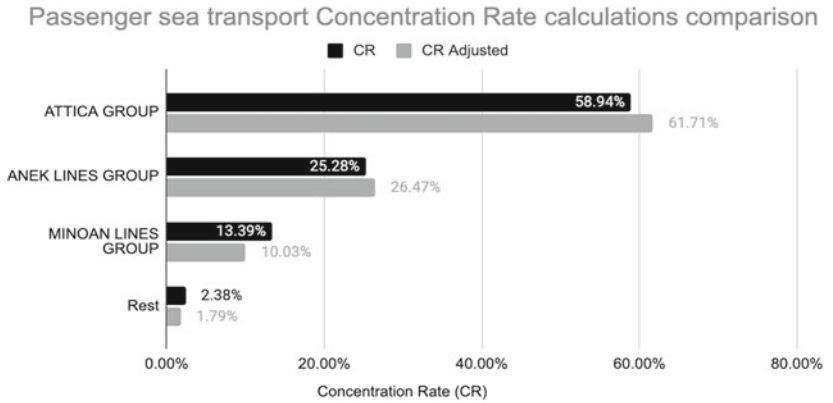

Fig. 6.6 The revised and the initial concentration rate for the Passenger Sea Transport sector

The figure below shows the output of Table 6.21. The joint venture mainly affected the MINOAN LINES group, as its influence in the industry decreased by 3.36% (Fig. 6.6).

6.4.7 Air Transport Sector

The Air Transport industry is concentrated in a small number of entities and executives with the dominant groups AEGEAN, AVIAPERS,

MOUZENIDIS (via ELLINAIR), and INTERSALONIKA (via AIR INTERSALONIKA). The executives of the companies are active in several external sector entities (e.g., TITAN, Athens Stock Exchange, MOTOR OIL) thus expanding the business network. Major characteristics of the industry include the partnership in the field of tourism through the association of large shipping and air transport groups, as well as the strong presence of companies with the main objective of promoting tourism (e.g., Marketing Greece S.A.). The presence of the Mouzenidis Group is not strong in the industry, as it has no connections with other entities of the industry. According to the financial data of 2019, Table 6.23 shows the estimations of the traditional CR.

In the sector of passenger air transport, there is an intense cooperation and exchange of executives. A typical example is Mastorantonakis Iosif, who has been Managing Director at Skyserv (a subsidiary of the AVIAPERS group) and a member of the AEGEAN group (Table 6.24).

The two-related groups had a cumulative CR of 81.73%, while the revised CR is 84.59%. The AEGEAN GROUP benefited the most from the relationship (+2.49%) and the AVIAPERS GROUP was strengthened by just 0.37%. The recalculation of CR is presented in detail in Table 6.25.

Table 6.23 CR estimation using the traditional approach[1]

Group (Entity)	*2019 Revenue (in mm €)*	*CR (%)*
AEGEAN Group	€1,308.80	71.12
INTERSALONIKA Group (AIR ΙΝΤΕΡΣΑΛΟΝΙΚΑ)	€2.58	0.14
MOUZENIDIS Group	€112.45	6.11
AVIAPERS Group	€195.19	10.61
Market total	€1,840.30	100

Source Author's calculations

[1] For the INTERSALONIKA and MOUZENIDIS groups, this study accounts only for the turnovers of their active subsidiaries in the sector. The turnover of the MOUZENIDIS group refers to the fiscal year 2018, as no financial standings have been published for 2019.

Table 6.24 Input data for the calculation of the revised CR

Common Entity	*MastorantonakisIosif*	
Involved Entities	*AEGEAN GROUP*	*AVIAPERS GROUP*
Management positions in related entities	executive member	CEO
Ownership relations in related entities	–%	–%
Distance in the business network	level 1	level 1
Turnover of the connected business entity	–	

Source Author's calculations

Table 6.25 Adjusted CR distribution based on VARDINOGIANNIS IOANNIS IOSIF effect

MASTORANTONAKIS IOSIF	
CR (2) (initial)	84.22%
REST (initial)	18.27%
MULTIPLIER	0.035
ADDED VALUE	2.86%
ADJUSTED CR (2)	84.59%
ADJUSTED CR (Rest)	15.41%
Added value AEGEAN GROUP	2.49%
Added value AVIAPERS GROUP	0.37%
CR AEGEAN GROUP (Adjusted)	73.61%
CR AVIAPERS GROUP (Adjusted)	10.98%
CR INTERSALONIKA (Adjusted)	0.12%
CR MOUZENIDIS GROUP (Adjusted)	5.15%

Source Author's calculations

The Figure below shows the output of Table 6.25. The presented interconnection mainly strengthened the AEGEAN group, as AEGEAN is the dominant industry (Fig. 6.7).

6.5 Discussion

A company's business network influences its performance and its strategic choices. The effect of a company on its industry is evaluated based on the holding market share, i.e., the percentage of the total turnover of the sector accrued by the particular entity. However, since the company is also affected by its direct or indirect relationships with other market entities,

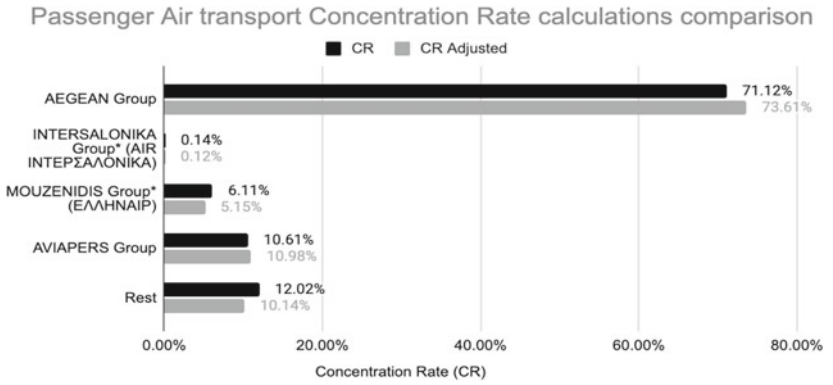

Fig. 6.7 The revised and the initial concentration rate for the Passenger Air Transport sector

its percentage of influence on the industry cannot be based solely on its own turnover.

Current business concentration indicators assume that companies operate independently. In actual fact, this is rarely the case. In most cases, companies in the same sector (usually the strongest) establish joint companies and/or their management members collaborate with third parties. This study attempts to present the existing conventional indicators in a more realistic form using available business data on entities which, under specific circumstances, establish their business relationships.

In this context, our initial effort paves the way for the enrichment of the business concentration indicators. The improvement on traditional indicators is achieved by adding innovative features that record the type of the relationship among entities of the same industry as they aim to improve of their effectiveness.

This study attempts to advance the significance of the existing ratios using objective, unbiased variables, such as joint ventures and the persons that constitute the management of affiliated companies, who provide open data and establish business cooperation. In this context, we utilize data on the cooperation of companies in the same industry through the news and social networks. To more accurately capture the influence of a company on its industry, the recalculation of the concentration index is proposed in light of a corporate network, rather than considering a company as an individual/independent unit. This innovative method of

calculating the index is based on a system of evaluating the company's relations to clearly determine the importance of interaction between the nodes. The new index essentially calculates to what extent the examined node has contributed to its own turnover as well as to the turnover of its interfaces.

A company's business network influences its performance and strategic choices. The influence of a company in its branch of activity is evaluated in terms of the market share it holds and more specifically in the percentage of the total turnover of the branch that the specific company produces. However, as the company is affected by both its direct and indirect relationships with other market entities, its percentage of influence in the industry cannot be based solely on its own turnover.

References

Amountzias, C. (2017). An investigation of the degree of market power in the greek manufacturing and service industries. *Journal of Industry, Competition and Trade, 17*(4), 447–464.

Bukvic, R. (2019). Evolution and current status of the competitive environment in the Serbian Banking Sector: Concentration indices analysis. *Serbia: Current political, economic and social issues and challenges*. Nova Science Publishers, Inc., 23–42.

Kostić, M. (2009). Supply concentration analysis in Serbian insurance sector. *Industrija, 37*(2), 59–77.

Kvålseth, T. O. (2018). Relationship between concentration ratio and Herfindahl-Hirschman index: A re-examination based on majorization theory. *Heliyon, 4*(10), e00846.

Kwoka, J. E., Jr. (1985). The Herfindahl index in theory and practice. *Antitrust Bulletin, 30*, 915.

Pautler, P. A. (1983). A guide to the Herfindahl index for antitrust attorneys. *Research in Law & Economics, 5*, 167–190.

Pavic, I., Galetic, F., & Piplica, D. (2016). Similarities and differences between the CR and HHI as an indicator of market concentration and market power. *Journal of Economics, Management and Trade,* 1–8.

Peterson, R. D. (1980, Spring). Product differentiation, implicit theorizing, and the methodology of industrial organization. *Nebraska Journal of Business and Economics,* 22–36.

Polemis, M. (2014a). Empirical estimation of market power in Greece. *Applied Economics Letters, 21*(11), 747–750.

Polemis, ML. (2014b). Measuring market power in the Greek manufacturing and services industries. *International Review of Applied Economics, 28*(6), 742–766. https://doi.org/10.1080/02692171.2014.923386

Rezitis, A. N., & Kalantzi, M. A. (2013). Measuring the degree of market power in the Greek manufacturing industry. *International Review of Applied Economics, 27*(3), 339–359.

Roeger, W. (1995). Can imperfect competition explain the difference between primal and dual productivity measures? Estimates for U.S. *Manufacturing. Journal of Political Economy, 103*, 316–331.

Sleuwaegen, L. E., De Bondt, R. R., & Dehandschutter, W. V. (1989). The Herfindahl index and concentration ratios revisited. *Antitrust Bulletin, 34*, 625.

Sleuwaegen, L., & Dehandschutter, W. (1986).The critical choice between the concentration ratio and the H-index in assessing industry performance. *The Journal of Industrial Economics,* 193–208.

Trèsor-Economics. (2008). Competition within Sectors in France. Treasury and Economic Policy No. 27. General Directorate.

Veselinović, M., & Radukić, S. (2021). Measuring supply concentration on the Serbian oil and oil derivates market by Herfindahl-Hirschman Index. *Facta Universitatis, Series: Economics and Organization, 1*, 343–356.