تقييم موانئ الحاويات في البحر الأبيض المتوسط باستخدام مصفوفة مجموعة بوسطن الاستشارية

Evaluation of Mediterranean market container ports using Boston Consulting Group Matrix

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الملخص:

في الآونة الأخيرة، تواجه التحسينات المستدامة للأعمال تحديات متنوعة بسبب المنافسة الاقتصادية العالمية. ومع ذلك، يمكن التغلب على هذه التحديات من خلال استراتيجيات عمل فعالة. يهدف هذا البحث إلى تحليل السوق والتحقيق في الاتجاهات الحالية في تنافسية الموانئ في حوض البحر الأبيض المتوسط من خلال تحليل سوق الناقلين لتحديد نوع هيكل السوق باستخدام نموذج BCG . يحتوي هذا البحث على جميع موانئ الحاويات التي تزيد طاقتها التصميمية عن مليون حاوية قياسية (TEU) سنويًا. يقتصر هذا البحث على موانئ الحاويات المحددة في البحر الأبيض المتوسط.

الكلمات المفتاحية: موانئ الحاويات، التنافسية، مجموعة بوسطن الاستشارية.(BCG)

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1 - مدير محطة عدن للحاويات، باحث ماجستير بالأكاديمية العربية للعلوم والتكنولوجيا والنقل البحري

Abstract

Recently, sustainable improvement of business faces various challenges for the global economic competition. However, these challenges can be overcomes by efficient business strategies. This research aims to analyze the market dynamic and to investigate the current trends in port competitiveness in the Mediterranean basin by analyzing the dynamics of the carriers' market, to determine the type of market structure using BCG model. This research is containing all container ports which have a design capacity more than one million TEU per year. This research is limited to the defined container ports in the Mediterranean.

Keywords: Container Ports, Competitiveness, Boston Consulting Group (BCG).

1. Introduction

Market concentration refers to the number of firms that account for the total production within a given industry at a point in time. Industrial concentration is necessary for investors, consumers and regulators. The main idea is to identify how many firms account for the majority of the product produced within a given market. Market structuring is a way to classify markets based on the level of competition among dealers in the market. Market structure can defined as the number of competing firms and their market share (Ismail, 2019).

The market structuring is a way to classify markets based on the level of competition among dealers in the market (Pehlivanoğlu and Tiftikçigil 2013). Market structure can be defined as the number of competing firms and their market share. Measurement of market structure that is most widely used in the United Kingdom, United States and Canada is an assessment of concentration. The most commonly used concentration tool is the percentage of output, or any other indicator of industry size such as employment (Obrębalski and Walesiak, 2015) and rail freight (Crozet, 2017).

The Mediterranean Sea is a link point between Europe, Africa and Asia. The ports of the Mediterranean Sea are areas of trade between the countries along its coasts. They also, play an increasingly important role extending toward the continents that surround the Mediterranean basin, or even on an international scale, and their significance particularly emphasized in the trade between Europe and Asia. The strategic location of container terminals in the Mediterranean Sea gives these ports a strategic advantage.

The Mediterranean Sea has a strategic geographical location that makes it one of the preferable transshipment areas in the world. It is located along one of the major shipping trade routes: from Southeast Asia to Northern Europe and to America's west coast. The Mediterranean basin is the area around the Mediterranean Sea and reaches three continents: Europe (south), Asia (near east) and Africa (north). It is by definition limited by the Strait of Gibraltar to the West, the Suez Canal to the East and the Bosporus Strait to the Northeast (Elsayeh, 2015).

This research will answer the following questions:

1. What are the tools that are used in evaluating Market Concentration?
2. Is the Mediterranean container port' market is going to be more competitive?

2. Literature Review

There are many indexes used to measure the market concentration such as: Hall-Tideman index "HTI" index, Entropy index (E)", The

Comprehensive Industrial Concentration Index (CCI), The Hannah and Kay Index (HKI), Gini Coefficient (GC), Hachman Index and The Hause Indices (H); because they are the most common and simple measures that are used in earlier studies such as (Akomea and Adusei, 2013; Elsayeh, 2015; Obrębalski and Walesiak, 2015; Krivka, 2016; Yaşar and Kiracı, 2017; Ismail, 2019). In this research, the Boston Consulting Group (BCG) used to analyze the dynamics of the Mediterranean container terminals' market.

Concentration ratios are widely used for characterizing industrial structures. Concentration Ratio (CR) is one of the early indicators that takes market concentration into account (Parkin, 2011). CR is defined as the sum of market shares of the largest markets in the industry. Concentration ratio is used basically for two purposes first, to measure the market coverage ratios of several largest companies which manufacture a special product in a private sector and second, to measure the degree of oligopoly of the largest companies (Çalmaşur and Daştan, 2015).

N-Firm concentration ratio is the oldest and commonly used index known among the concentration criterions (Çalmaşur and Daştan, 2015). There are the first two (CR2), first four (CR4), first eight (CR8), first ten (CR10) or first twelve companies (CR12). But, the Four-Firm Concentration Ratio (CR4) is the most relevant index to measure concentration before the advent of the HHI (Naldi and Flamini, 2014). It is given by the sum of the market shares of the largest four, eight or twenty firms in the market; according to (Çalmaşur and Daştan, 2015) CRN can be explained as:

The range of the concentration ratio is from almost zero for perfect competition to 100 percent for monopoly. A low ratio indicates a CR high degree of competition. On the other hand, a high concentration ratio indicates an absence of competition and the closer to an oligopolistic or monopolistic type of market structure (Pehlivanoğlu and Tiftikçigil, 2013).

The main advantage of CR lies in its simplicity and limited data requirements which can usually be found in various international reports (Bikker and Haaf, 2002). However, this index does have some disadvantages. It is assumed that relative size is the only factor worthy of consideration. In general, CR is not taking into consideration all firms which are active in an industry; but just a limited number of companies. Furthermore, it is not giving information about the relationship between relative strength's division among the group of big firms and the other industry firms. Also, concentration ratio does not indicate if the largest companies are always the same large companies or not (Çalmaşur and Daştan, 2015).

BCG evaluates the growth share matrix was evolved in the early 1970s by Bruce Henderson, to help corporations make investment or disinvestment decisions related to their business units or product portfolios. This model can be part of choosing port for proposed integration. BCG matrix categorizes business units are depending on whether they deserve cash infusions or need close down. BCG consisting of four categories (Mohajan, 2018, Elsayeh, 2015; Atta, 2020).

First: Stars, Stars. Stars operate in high growth industries and maintain high market share. Stars are both cash generators and cash users. They are the primary units in which the company should invest its money, because stars expected to become Cash cows and generate positive cash flows. Yet, not all stars become cash flows. This is especially true in rapidly changing industries, where new innovative products can soon be outcompeted by new technological advancements, so a star instead of becoming a Cash cow, becomes a dog. Strategic choices in stars is vertical integration, horizontal integration, market penetration, market development, product development.

Second: Cash cows. Cash cows are the most profitable brands and should be “milked” to provide as much cash as possible. The cash gained from “cows” should be invested into stars to support their further growth. According to growth-share matrix, corporates should not invest into Cash cows to induce growth but only to support them so they can maintain their current market share. Again, this is not always the truth. Cash cows are usually large corporations that are capable of innovating new products or processes, which may become new stars. If there would be no support for Cash cows, they would not be capable of such innovations. Strategic choices in Cash cows is product development, diversification, divestiture, retrenchment.

Third: Question marks. Question marks are the brands that require much closer consideration. They hold low market share in fast growing markets consuming large amount of cash and incurring losses. It has potential to gain market share and become a star, which would later become Cash cow. Question marks do not always succeed and even after large amount of investments, they struggle to gain market share and eventually become dogs. Therefore, they require very close consideration to decide if they are worth investing in or not. Strategic choices: Market penetration, market development, product development, divestiture.

Four: Dogs. Dogs hold low market share compared to competitors and operate in a slowly growing market. In general, they are not worth investing in because they generate low or negative cash returns. Nevertheless, this is not always the truth. Some dogs may be profitable for long period of time, they may provide synergies for other brands or SBUs or simple act as a defense to counter competitors moves. Therefore, it is always important to perform deeper analysis of each brand or SBU to make sure they are not worth investing in or have to be divested. Strategic choices: Retrenchment, divestiture, liquidation.

There are many pros to the BCG such as; it is Easy to perform; helps to understand the strategic positions of business portfolio and it is a good starting point for further more thorough analysis. It also has cons such as: It does not define what ‘market’ is; Businesses can be classified as cash cows, while they are actually dogs, or vice versa; does not include other external factors that may change the situation completely, finally, market share and industry growth are not the only factors of profitability. Besides, high market share does not necessarily mean high profits. Varan and Cerit, (2014) analyzed the industry concentration and competition in the specific context of container ports in turkey to measure the outcome of Turkey’s recent privatization process by using HHI, Shift share analysis, and concentration ratio. The statistical findings of this study suggest that the recent port privatizations have been successful in stimulating private investments and competition. The top 22 container ports in the Mediterranean is assessed by Elsayeh, (2015) using Boston Consultant Group (BCG) matrix to visualize the dynamics between ports in the defined market to assess the ports' competitive position, in the period between 1998 and 2012.

Elbayoumi & Dawood, (2016) provides a satisfactory understanding of the market share and competition of selected container terminals in the Middle Eastern region by using HHI to analyze 24 container terminals from 12 countries in the region. Based on analysis the 24 terminals in the region only five terminals (Dubai included Jebel Ali, Suez Canal C. terminal, Ambarli, Salalah and Jeddah) are growing constantly; the rest of the terminals are inefficient. Aden terminal shows the lowest level of Market share with a score of 0.201.

More recently, El-Haddad et al., (2017) analyzed the East Mediterranean market behavior concentration during the period from 1995 to 2014 by using the Concentration Ratio (CR3 and CR5), HHI and SSA. The researchers found that the container port/terminal in the stated region is going to be concentrated in 2014 along with the continued growth rate and the market share of the port of Piraeus and Ambarli or the market tends monopoly.

3. The proposed framework

BCG matrix is used to visualize the dynamics between the container ports. The BCG Matrix establishes a model for allocating resources among various business units and compares many business units at the same time. Boston Consulting Group (BCG) can help the business organizations to develop their efficiency for the successful operation of their business activities (Mohajan, 2018). Although BCG analysis has lost its importance due to many limitations, it can still be a useful tool if performed by following five steps:

Step one: Choose the unit. Which unit will be chosen will have an impact on the whole analysis. Therefore, it is essential to define the unit for which you will do the analysis.

Step two. Define the market. Defining the market is one of the most important things to do in this analysis. This is because incorrectly defined market may lead to poor classification.

Step three. Calculate relative market share, using Microsoft Excel (2019) . Relative market share can calculated in terms of revenues or market share. It is calculated by dividing your own brand's market share (revenues) by the market share (or revenues) of your largest competitor in that industry.

$$\text{Relative Market Share} = \frac{\text{Your firm's market share (or revenues)}}{\text{Largest competitor's market share (or revenues)}}$$

Step 4. Find out market growth rate. The industry growth rate can found in industry reports. It can also calculated by looking at average revenue growth of the leading industry firms. Market growth rate measured in percentage terms. The midpoint of the y-axis is usually set at 10% growth rate, but this can vary. Some industries grow for years but at average rate of 1 or 2% per year. Therefore, when doing the analysis you should find out what growth rate is seen as significant (midpoint) to separate cash cows from stars and question marks from dogs. Step five. Draw the circles on a matrix. After calculating all the measures, you should be able to plot your brands on the matrix.

1. Stars (High Growth, High Market Share):
   - Located in the top-left quadrant.
   - Ports here are leaders in fast-growing markets.
   - They require substantial investment to maintain their position.
   - Observation: The matrix shows no ports distinctly in this quadrant, suggesting a lack of dominant market leaders with both high growth and high market share among the analyzed ports.

2. Question Marks (High Growth, Low Market Share):
   - Located in the top-right quadrant.
   - Ports in this quadrant have high growth potential but currently have a low market share.
   - These ports need significant resources to increase their market share and potentially become "Stars."

- Strategic Insight: Focus on investment in infrastructure, marketing, partnerships, and technological advancements to improve their market position.

3. Cash Cows (Low Growth, High Market Share):
   - Located in the bottom-left quadrant.
   - Ports here have a high market share in a slow-growing market.
   - They generate stable revenue with minimal need for investment.
   - Strategic Insight: Maintain operational efficiency and optimize cost structures to continue generating steady cash flow.

4. Dogs (Low Growth, Low Market Share):
   - Located in the bottom-right quadrant.
   - Ports in this quadrant have a low market share in a low-growth market.
   - These ports are often candidates for divestiture or repositioning.
   - Strategic Insight: Evaluate potential for niche strategies or consider divestment to reallocate resources to more promising areas.

4. Empirical study

In this research BCG matrix identifies four market positions:

Question mark, which reveals that the future potential of the ports is uncertain, ports have high rates of growth but their market share is not significant. Stars, which present ports with high future potential, high growth rates and market share. Cash cows, which are ports in decline with a high market share but low increase rates. Dogs, which present ports with a little or zero development perspective: growth rates and market share are reduced (Atta, 2020).

This BCG matrix offers a clear visual representation of the market positioning and growth potential of various Mediterranean and Black Sea ports. Ports like Limassol and Damietta in the "Question Marks" quadrant need significant investments to enhance their market share and potentially become "Stars." Established ports like Valencia and Algeciras in the "Cash Cows" quadrant should focus on maintaining their efficiency and profitability. Ports in the "Dogs" quadrant, such as Livorno and Taranto, need to be evaluated for potential strategic changes or divestment. This analysis helps in making informed decisions regarding resource allocation and strategic investments.

As illustrated in figure (1), different ports are placed in the matrix according to total throughput in 2002 than 2017. The vertical axis of the matrix presents the annual average rate of growth while the average market share is presented by the horizontal axis. As such, an analogous decision matrix is made in which every port position is described in terms of annual average rate and average market share. Figure shows that Barcelona, Genoa, Ambarli, Tangier, Piraeus, Valencia, Marsaxlokk are stars. Those are ports with an annual rate of growth higher than the average growth rate of the Mediterranean container port market and a significant market share. These ports may create cash but because of the fast growing market, stars need huge investments to retain their lead. Ports positioned in this cell were attractive as they are situated in a robust market. These ports are very competitive in the market.

Port Said and Algeciras are cash cows; whom has low average growth rate and high market share. Constantza, Taranto, Livorno and GioiaTauro display the worst results and appear as dogs, since they have low annual growth rates and no significant market share. They neither create revenue nor need a huge investment. Because of low market share, these ports encounter cost disadvantages.

Limassol, Damietta, Odessa, Novorossiysk, Beirut, Cagliari, Naples, Ilchevsk, Koper, Spezia, Haifa, Alexandria, Sines, Izmir, Ashdod, Mersin, Ashdod, Ilchevsk and La Spezia are question marks, that is, ports with a significant annual growth rate but with low market share . These ports require a huge amount of investment to maintain or gain market share. Question mark ports try to enhance their quality of service to attract more customers. If these ports do not invest in their infra/superstructure as well as their quality of service, they may become dogs, while if huge investment is made, then they have potential of becoming stars

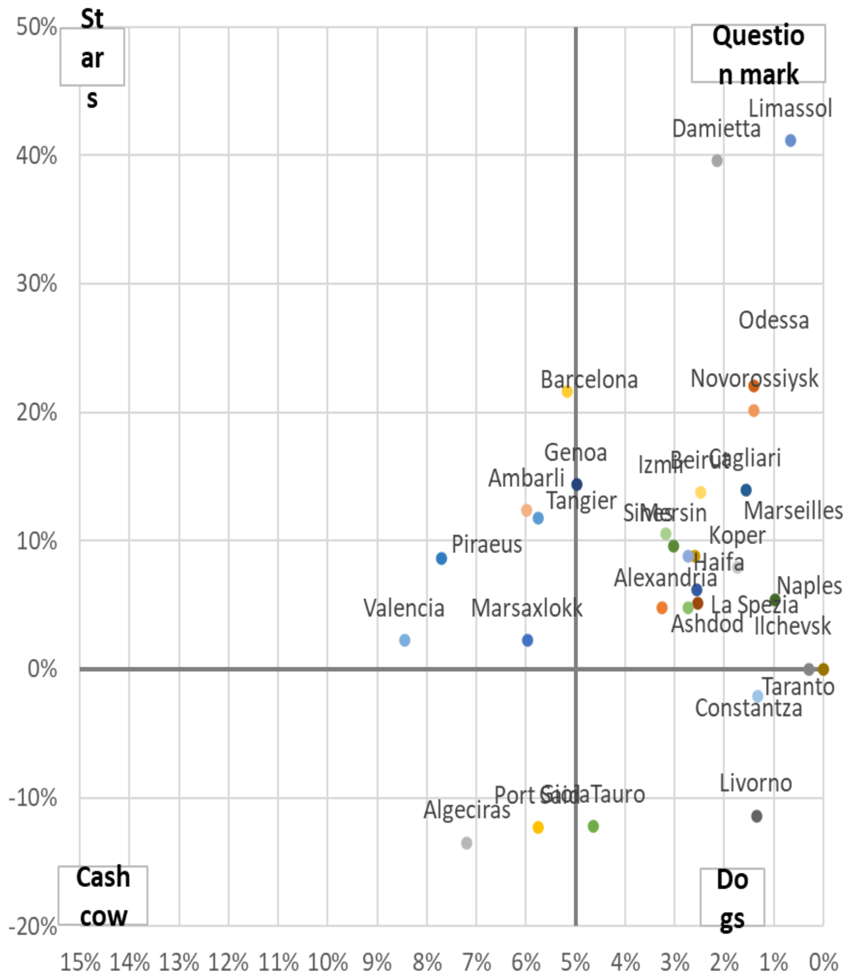

Figure (1) Mediterranean container ports BCG matrix.
Source: by the authors

5. Conclusions

This research is the first which Evaluate the Mediterranean market container port using Boston Consulting Group Matrix; on the following ports (Marsaxlokk, Alexandria, Damietta, Port Said, Tangier, GioiaTauro, Genoa, La Spezia, Livorno, Cagliari, Naples, Limassol, Novorossiysk, Algeciras, Barcelona, Valencia, Ashdod, Haifa, Odessa, Ilchevsk, Marseilles, Piraeus, Mersin, Izmir, Ambarli, Koper, Beirut, Constantza and Sines); using Microsoft Excel (2019).

Ports of Limassol, Damietta, Odessa, Novorossiysk, Beirut, Cagliari, Naples, Ilchevsk, Koper, Haifa, Alexandria, Sines, Izmir, Ashdod, Mersin, Ashdod, Ilchevsk and La Spezia are rating as a low relative market share, but also, they compete in an industry with a high growth rate. Therefore, this ports does not have ability to generate and provide cash, while their need for cash is very high. Although these ports are difficult to determine their future, because they may fail or succeed, therefore, those ports spends large amount of money on infra and super structure, to impose the acceleration of growth in the market and to achieve more closeness towards the leading ports in the market. If they looking for the stare cell they must invests a lot of money on the services offers in addition to most of this ports should adopt growth strategies or market penetration strategy, as these ports must focus on achieve more sales of the services provided in the current market to increase your market share. This means more advertising and marketing effort to be able to acquire a greater proportion of the market share, expand customer base and try to make the most of the energies of your current market with its current service.

Port Said and Algeciras are cash cows It is also called the cash-generating units, considering that the services offer achieve great cash returns for the port as it enjoys a large market share, which means that it is the leader of the market, despite the fact that the market growth rate is low in it. The port pursues in its business strategy the following to deal with this cell, which is characterized by a position of great relative competition, but is competing in an industry with a low growth rate, and many of them were stars yesterday. Given this dominant situation, and its minimal need for additional resources, it generates a surplus of cash that exceeds its need. It seeks to keep its products within this cell for as long as possible as long as it achieves cash flow from one side and so that it does not transfer to the dog cell, which means the possibility of withdrawing from the market on the other side.

Barcelona, Genoa, Ambarli, Tangier, Piraeus, Valencia, Marsaxlokk are stars. The metaphor of this cell with the stars indicates that the services are strong and advance over the competitors and that the chances of maintain their success are great and it may be difficult for competitors to reach them represent the best opportunities for the enterprise in the long run in both growth and profitability. In such a case, Star ports must receive more investments to maintain this position or increase this control over the market. The best strategies for them is all types of integration either forward or backward vertical or horizontal. Also, research and development activities should be intensified in order to provide services with more distinctive characteristics in order to maintain their competitive advantage and reduce the possibility of competition. These ports face competitors by reducing prices or enhancing promotional activity in innovative and new ways and methods, as well as adopting diversification policies in distribution operations and selecting more influential distribution outlets in the market.

Constantza, Taranto, Livorno and Gioia Tauro display the worst results and appear as dogs as these ports are considered to have a relatively low competitive position, and a low or no growth rate. That indicating that the services of this ports have an unknown future and may lead to exit from the market. This ports represents a low relative market share and a corresponding low rate of growth in the market. However, the port distributes its services on the probability that one or more of them will achieve potential successes reflected in the market surveys carried out by the Marketing Department. Or that the service provided has a previous reputation and reputation and the ports seek to keep it in order to help stimulate interest in other products that the ports deal with, for example transit. But most of these services are destined to quit and exit the market because their cost is more than the returns they achieve. But it can achieve some positive aspects, for example it provides the opportunity, quickly and accurately, for the port administration to determine the service it deals with and the impact of its competitive position.

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Appendix 1: Previous research about concentration in ports and other sectors.

N	Authors	Title	Applied concentration indicators	Research Area	Results
1	Beattie et al. (2003)	And then there were four: A study of UK audit market concentration-causes, consequences and the scope for market adjustment	CR4, CR4 and CR8	Measure concentration within the UK listed company audit market as at April 2002.	Levels of concentration are significantly higher in the premier market segments and certain industry sectors.
2	Lijesen (2004)	Adjusting the Herfindahl index for close substitutes: an application to pricing in civil aviation.	HHI	Reviewed the concentration and competition level of the civil aviation sector by correcting the Herfindahl-Hirschman Index.	The empirical findings of the study showed that the corrected Herfindahl-Hirschman Index gives better results than the traditional indicators.
3	Judith (2007)	Market Structure and Penetration in the Latin American Mobile Sector	HHI	The paper investigates the process of consolidation in the mobile market of Latin America and, analyses the relationship between concentration, spectrum allocation, and prices.	Pricing strategies had a very significant impact over penetration. Brazil and Mexico that have quite different levels of concentration and almost the same penetration.
4	Tushaj (2010)	Market concentration in the banking sector:	CR3, CR5 and HHI	The working paper examined the	There are more and more efforts made by banks to be better positioned in the market.

		Evidence from Albania.		nature and the extent of changes in market concentration of Albanian banking sector.	
5	Notteboom (2010)	Concentration and the Formation of Multi-Port Gateway Regions in the European Container Port System: an Update.	HHI	Trends and issues underlying recent developments in the European container port system.	Routing flexibility is a keystone for the logistics attractiveness of a region.
6	Fageda (2011)	Load Centers in the Mediterranean Port Range. Ports Hub and Ports Gateway.	HHI, Gini Coefficient, Share-Shift Analysis	Competition among main Mediterranean ports for becoming the dominant port of the system	Gini coefficient can produce wrong results when we examine a port system with a small number of ports.
7	Liu et al. (2011)	An Analysis of the Competition of Ports in the Shanghai International Shipping Hub.	HHI, Share-Shift Analysis	Concentration and competition in the Shanghai International Shipping Hub with its two main ports.	The degree of concentration of port system and the competitiveness of port depend on both natural conditions and the developed hinterland.
8	Beck, et al (2012)	Concentration and Market Structure in Local Real Estate Markets	CR4 and HHI	A study of the concentration and market structure of the US local real estate market for 2007 and 2009.	A lack of competition may arise in an industry for a variety of reasons, but one explanation that our research refutes is a concentrated size distribution of firms in local real estate brokerage markets.

9	Sandulli et al. (2012)	Testing the Schumpeterian Hypotheses on an Open Innovation Framework.	CR4	The study explores the unclear relationship between industry structure and open innovation.	They suggested that, market concentration and technology maturity discourages the adoption of Open Innovation while technology uncertainty and complexity promote its adoption.
10	Maksimović and Kostić (2012)	Limitations in The Application of Concentration Indicators – Example Of Insurance Market In Serbia, Croatia, Slovenia, Romania And Austria.	CR4, HHI, Lorenz curve, GC and E index	The aim of the paper is to show the possibilities and limitations of indicator application as an instrument for the assessment of companies' non-competitive behavior concentration on the example of the insurance market of the selected countries "Serbia, Croatia, Slovenia, Romania and Austria" from 2004 until 2009.	The analysis showed that independent application of indicator concentration is not sufficient and should be supplemented with qualitative data on: market characteristics, industry tradition, the height of entry barriers, manager behavior and the like.
11	Luigi (2012)	Bank Concentration, Private Credit, and Firm Turnover: Evidence from the Enlarged	CR3, CR5 and HHI	The study explores the relationship between the firm turnover in the economy and the banking sector	Estimation results show that a higher degree of bank concentration is associated with lower firm turnover only in countries with a large banking sector.

		European Union		concentration in the EU countries.	
12	Akomea and Adusei (2013)	Bank recapitalization and market concentration in Ghana's banking industry: A Herfindahl-Hirschman Index analysis.	CRM and HHI	The paper investigates the concentration levels of the banking industry in Ghana from 2003-2010.	For the past eight years the banking industry in Ghana has been highly competitive with no signs of concentration.
13	Pehlivanoğlu and Tiftikçigil (2013)	A Concentration Analysis in The Turkish Iron-Steel and Metal Industry	CR4, CR8, CR12 and HHI	Define the market structure of the Turkish Iron-Steel and metal industry during the period 1995-2001.	The iron-steel and metal industry having a non-concentrated market structure based on the HHI index value, a market structure of monopolistic competition was observed based on the CR4 index value whereas the CR8 and CR12 index values typically led to an oligopolistic market structure, except for some years.
14	Liu and Altshuler (2013)	Measuring the Burden of the Corporate Income Tax under Imperfect Competition.	CR4	The paper assesses the burden of the corporate income tax on wages under imperfect competition in the US industries.	The empirical results suggest that labor bears a significant portion of the burden of the corporate income tax. The elasticity of wages with respect to the corporate marginal effective tax rate increases with industry concentration.

15	Nguyen and Stewart (2013)	Concentration and Efficiency in the Vietnamese Banking System between 1999 and 2009. A Structural Model Approach.	CR3, CR5 and HHI	They aimed to examine the degree of concentration and efficiency in the Vietnamese banking system in 1999-2009.	Empirical results show that the Vietnamese banking industry has become substantially less concentrated; however, large commercial banks still dominate the whole banking system.
16	Hoxha (2013)	The Effect of Banking Market Structure on the Volatility of Growth of Manufacturing Sectors in Developing Countries.	CR5 and HHI	The study explores the effect of banking concentration and banking competition on the volatility of the growth of value added of the manufacturing sectors in developing countries.	Banking concentration has a dampening effect on the volatility of growth of the industries. As banking competition increases, the volatility of the growth of industries increases, also.
17	Naldi and Flamini (2014)	The CR4 Index and the Interval Estimation of the Herfindahl-Hirschman Index.	HHI and CR4	Market shares in the U.S. consumer book industry, the civil aviation industry and the mobile phone industry.	Monotonic relationship that may expect between the CR4 and HH is not confirmed
18	Susilo and Axhausen (2014)	Repetitions in individual daily activity–travel–location patterns: a study using the Herfindahl–Hirschman Index.	HHI	They examined the market concentration in terms of daily travel habits and location.	They found that the repetitiveness of individual activity–travel–mode–location combinations is highly influenced by the individuals' out-of-home commitments, the intra-household conditions and the availability and

					the accessibility of the activity locations
19	Obrębalski and Walesiak (2015)	Functional structure of Polish regions in the period 2004-2013 measurement via HHI index, Florence's coefficient of localization.	HHI	To measure sectorial concentration to determine regional functional specialization	Each region has individual and diversified potential, regional identity and the level of economic competitiveness
20	Çalmaşur and Daştan, 2015	Concentration in the Turkish Cement Industry.	CR4, CR8, HHI and E Index	The main objective of this study is to analyze the market structure of the Turkish Cement Industry for the period of 2010-2014.	It can be stated that, the industry has a competitive market structure, in the light of HHI and E Index. As a result of CR4 and CR8 analysis carried out, the industry is determined to be a weak oligopolistic.
21	Pavic et al. (2016)	Similarities and Differences between the CR and HHI as an Indicator of Market Concentration and Market Power.	CR and HHI	US economy	There is no difference between the concentration ratio and the Herfindahl-Hirschman index

22	Krivka (2016)	On the Concept of Market Concentration, the Minimum Herfindahl-Hirschman Index, and Its Practical Application.	HHI	The paper analyses the phenomenon of market concentration in the context of the most popular industrial organization approaches	The author's opinion, (HHIM) should be applied to concentrated markets.
23	Crozet (2017)	Rail freight development in Europe: how to deal with a doubly-imperfect competition?.	HHI	Rail freight in Europe	The market structure is still characterized by a strong concentration. competition in rail freight can clearly be classified as imperfect competition.
24	Yaşar and Kiracı (2017)	Market Share, the Number of Competitors and Concentration: An Empirical Application on the Airline Industry	CRM and HHI	They examined the market structure and competition level of the airline market in the world between 2006 and 2015.	The market structure is generally competitive, but significant changes in market structure have taken place over the years.
25	Hossain, et al. (2017)	Diversification of Export to China: A Study on the Potentiality of Leather and Footwear Industry of Bangladesh	HHI	This paper aimed to explore the product diversification options of Leather and Footwear industry of Bangladesh to occupy larger share of China's import from 1995 to 2015.	China exposes high comparative advantage over 12, medium over 9 and low over 14 products in its import from the world in this industry.