

Measures of Competitive Intensity – Analysis Based on Literature Review

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Abstract

Purpose: To systematize the existing approaches and tools used for measuring competitive intensity.

Methodology: Systematic literature review along with critical literature review.

Findings: Identification of two main approaches to measuring competition intensity: the first pertains to research based on experts' opinions and involves the use of questionnaires (primary sources), while the second is based on structural variables used with a variety of indexes (secondary sources). In addition, variables applied for the purpose of measuring the intensity of competition are divided into structural and behavioural.

Research implications: Research implications are two-fold. Firstly, a distinction is made between various types of existing approaches to measuring competitive intensity. Secondly, research is carried out, *inter alia*, with regard to the actual object of certain measures, as opposed to their object stemming from commonly accepted definitions.

Practical implications: The issue of measuring competition intensity occupies a prominent place in the discussion on the effectiveness of inter-organizational relationships. The findings outlined in this paper may help managers to develop/adopt the right approach supporting their strategic decisions.

Originality: The paper provides a complex review of the existing methods and measures of competitive intensity. It systematizes recent knowledge about competitive intensity measurements.

Keywords: strategic management, competitive intensity, competition, systematic literature review, behavioural variables, structural variables.

JEL: D21, L21, L10

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*Those who do not know what they want usually end up
where they do not want to be.*

Bruno Ferrero

Introduction

For many decades in the 20th century, the competitive paradigm was the key viewpoint in strategic management (Dagnino et al., 2008) and, until today, theories related to competition remain a focus of nearly all academic textbooks. An important element accompanying the competitive paradigm is the sector approach popularized by M. Porter, with primary emphasis on the impact of the environment and the company's position within its sector of activity on its competitiveness (Porter, 1992; Miller, 1988). This approach has dominated research, theory and practice in the field in question.

In the last decade of the 20th century, the theory of strategic management was dominated by the approach focused on the diversity of companies, which contributed to the development of the resource-based view (Dyer and Singh, 1998; Rumelt, 1991). The opinion expressed already in the classic approach to formulating the strategy, relating to organizational skills and resources, can be considered the foundation for the development of the resource approach (Peteraf, 1993). In the resource-based view, it is assumed that an organization consists of a unique combination of skills and resources, in particular intangible ones (Stańczyk-Hugiet, 2012). Next to the sector approach (industrial organization), the resource-based view is the second most important strand explaining the sources of competitive advantage (Czakon, 2005), in which an enterprise forms the fundamental unit of analysis (Dyer and Singh, 1998).

The resource-based view, however, has not succeeded in thoroughly explaining why and how companies gain competitive advantage in the face of unpredictable and dynamic changes (Eisenhardt and Martin, 2000). Globalization, the rapidly changing market environment or the competitive approach – insufficient to strengthen the market position – have all incited researchers and entrepreneurs in recent years to focus on paradoxical phenomena, whose impact on organizational development is not straightforward (Czakon, 2013). Coopetition is – together with organizational ambidexterity (Raisch et al., 2009) and dynamic capabilities (Zollo and Winter, 2002) – is one of the most popular paradoxes examined by researchers.

Coopetition fills the gap between the competitive paradigm – typical of the beginnings of strategic management – and the cooperation paradigm (Dagnino et al., 2008). Coope-

tion is a new philosophy, strategy and approach that transcends conventional rules of competition and cooperation in order to create advantage through a simultaneous use of both types of relationships (Luo, 2004). This phenomenon denotes also the ability to enter into inter-organizational relationships; it is a strategy of joint value creation, the division of which has a variable structure of a positive-sum game (Czakov et al., 2012; Dagnino and Padula, 2002). As competition is considered a central element in the cooperation system, the majority of the existing scientific studies focus on competition as a starting point for reflection on the intensity of cooperation (Park et al., 2014). Interest in cooperation has contributed in the 21st century to a revival of competition studies, including those that focus on measuring its intensity, while literature on cooperation clearly demonstrates that cooperation is a means to reducing the intensity of competition (Czakov and Rogalski, 2014).

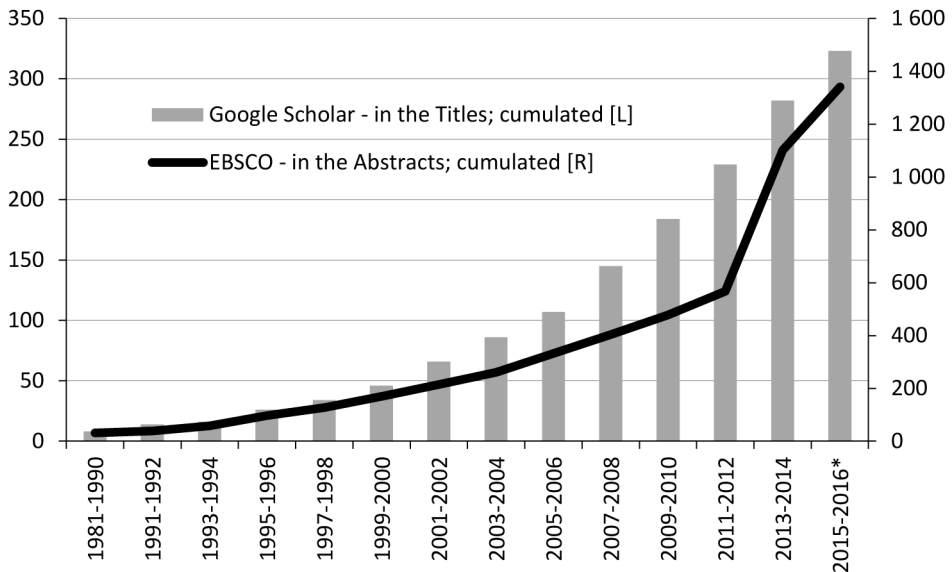
The growing interest in the field of intensity of competition can be seen by the number of academic publications that relate to this issue. A strong upturn in the number of scientific papers in the database Ebsco, which include in their abstracts one of the following phrases: “competitive intensity” or “intensity of competition” or “competition intensity”) , especially in the second decade of the twenty-first century. The choice of these formulations is the result of a separate analysis presented later in this paper. In 2013–2014 alone, the number of publications in the Ebsco database almost doubled, from nearly 570 papers at the end of 2012 to 1,100 publications at the end of 2014. Figure 1. shows a growing number of publications including at least one of the above phrases relating to the intensity of competition, both in Ebsco and Google Scholar databases. They were sought among keywords in the abstracts or in the titles of scientific publications respectively.

The growing interest of researchers and entrepreneurs in the subject of the intensity of competition is accompanied by the development of discussions on methods of its measurement. Depending on the approach presented by researchers, as well as the period during which the publications were published, the authors propose various ways of measuring the intensity of competition. The researchers and business practitioners use the notion “intensity of competition” (or “strong competition”) for a variety of purposes, both theoretical and practical. A clear meaning of the notion as well as the knowledge of how it should be measured is strongly needed, inter alia, to create an enterprise strategy, its conceptualization and operationalization, and to analyse the effects resulting from its implementation.

The very notion of an “intense (strong) competition” in the sector seems to be imprecise, hence there is a need to investigate and compare the different methods of determining

the scale of the phenomenon. Understanding the available methods for measuring the intensity of competition allows scholars and managers to use them intentionally. Simultaneously, it is possible, using accurate measurements to obtain more precise results, despite the limitations arising from, for example, the budget or time required to examine the intensity of competition.

Figure 1. Cumulative number of papers in Ebsco and Google Scholar including the phrases: “competitive intensity” or “intensity of competition” or “competition intensity”, sought in the abstracts (R) or in the titles (L) of scientific publications respectively.



* until 10.09.2016

Source: own study.

The article presents the literature review of the measures of the intensity of competition along with their characteristics and evaluation. The remainder of this paper is organized as follows. The following section presents the conceptual framework and method to guide the literature review. The next section describes measuring the intensity of competition, including, among others, two main approaches: quantitative measures based on the number of companies as well as measures based on studies conducted on the basis of a questionnaire. Both approaches are presented along with characteristic variables selected by the authors. After presenting the results of the analysis based on the literature review, the final section summarizes the results, and by critically evaluating these provides some implications for further research studies and managerial practice.

Method

In order to ensure a repeatable, scientific and transparent process of verification of literature sources pertaining to competition intensity measuring, an approach based on a systematic literary review was adopted, minimizing the researcher's bias (Czakov, 2011; Tranfield et al., 2003). In order to reduce the risk of overlooking literary sources that are of the essence for the object of analysis, publications selected on the basis of a systematic review were supplemented with several dozen other publications, repeatedly referred to by scholars.

The procedure adopted in the systematic literary review in the field of management science is somewhat less stringent than the procedure applicable, for example, in the case of medical sciences (Tranfield et al., 2003), even if a specific procedure is necessary in order to allow the replication of the review by other researchers. It should also be noted that all Internet tools, and therefore also databases, are dynamic, which can affect the results of future studies. The study can be further supplemented with a bibliometric analysis indicating, *inter alia*, trends in the literature (Czakov et al., 2014). A systematic literature review may include the following basic steps (Lee, 2009):

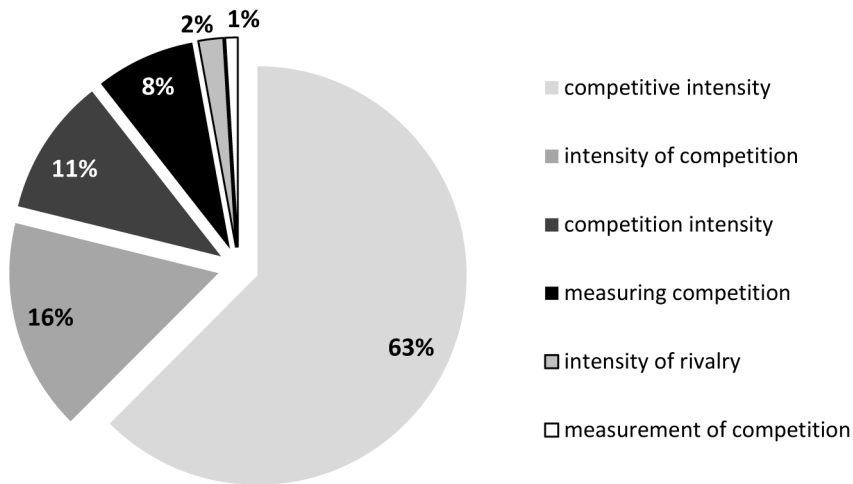
- selection of appropriate databases,
- keyword search among publications within a specific period,
- filtering publications – in terms of title syntax, removing duplicates or refining results, for instance to the context of the sector in question,
- analysis – analysis of abstracts, citations or the research procedure.

In order to analyse the literature selected on the basis of the above criteria, the following databases were chosen for the purpose of further studies: Ebsco, ScienceDirect/Elsevier/ICM, Emerald and Proquest. Due to the limited options of in-depth filtering, the list of databases used in the context of a systematic literature review did not encompass Google Scholar, which contains the largest number of publications. Google Scholar was, however, used later in order to search for additional literary sources and to verify the number of quotations of each publication.

Subsequently, a list of twelve terms and expressions was formulated; they were sought among keywords and titles of papers published between January 2000 and June 2015, and included in the selected databases. These were: “intensity of competition”, “competitive intensity”, “competition intensity”, “competition measuring”, “measurement of competition”, “measuring of competition”, “rivalry measurement”, “measurement of rivalry”, “measuring of rivalry”, “intensity of rivalry”, “rivalry intensity”, “rivalry measuring”.

In order to limit the list of key phrases/expressions, a query in the Ebsco database was created, as it has the largest number of bibliographic resources among the databases selected for the study. The analysis of expressions obtained from the Ebsco database showed that only six out of twelve terms/expressions were found among the results. They were used in queries carried out in the remaining databases. The incidence of the key phrases in the Ebsco database is shown in Figure 2.

Figure 2. The incidence of key expressions/terms pertaining to the intensity of competition in the Ebsco database



Source: own study.

The following steps in the systematic literature review were aimed at narrowing the bibliography to full-text academic publications² in English. Duplicates were eliminated, both within individual databases and among all databases. The largest number of duplicates were found in the Ebsco and ProQuest databases.

An additional filter was applied in order to select academic studies most relevant to the author's research on the impact of the intensity of competition on the performance of enterprises. Among the previously selected 90 publications, only those with the word "performance" in the abstract or title were singled out and a total of 41 results were obtained. After a further expert verification – an analysis of research methods and

² Academic publications: academic journals, dissertations, working papers, conference papers.

variables used in all 41 papers and rejecting the publications that did not outline methods of measuring the competition intensity – 33 sources remained; they are a result of the selection procedure conducted for the purposes of a systematic literature review, whose subsequent steps are presented in Table 1. The list of authors, publication dates and the number of quotations (as of 1 July 2015) of the publications selected through the systematic literature review, are presented in Table 2.

Table 1. Subsequent steps in the selection of publications for the systematic literature review

	EBSCO	ProQuest*	ScienceDirect (Elsevier)	Emerald Insight	Total
Keywords in the titles of papers published after 1999	104	57	51	6	218
English papers in the field of management, business and economy	90	47	41	6	184
Full text papers	36	23	41	2	102
Exclude duplicate papers	35	12	41	2	90
Additional filtered word “performance” in the titles or abstracts	21	2	20	0	41
Papers selected on the basis of a review carried out by the author and matching the content with the object of analysis	18	1	14	0	33

* “Performance” was selected as an additional keyword, as the measurement of competition intensity in research is closely linked to its impact on company performance.

Source: own study.

For the purposes of this paper, several dozen additional publications on the intensity of competition were used as additional sources; they are characterized by a high number of quotations and supplement the results of the described procedure. The statistical analysis was conducted only in relation to publications encompassed by the systematic literature review.

Table 2. Bibliography selected in a systematic literature review

	Source	No of citation		Source	No of citation
1	Ramaswamy 2001	103	18	Boso et al. 2012	30
2	Fischer and Kamerschen 2003	42	19	Chan et al. 2012	53
3	Auh and Menguc 2005	316	20	Wieseke et al. 2012	18
4	Cui et al. 2005	107	21	Leonidou, L.C. et al. 2013	9
5	Jermias 2006	3	22	Souare 2013	0
6	Carbonell and Rodriguez 2006	114	23	Tsai and Yang 2013	13
7	O'Cass and Ngo 2006	74	24	Leonidou, C.N. et al. 2013	40
8	Vroom and Gimeno 2007	50	25	García-Zamora et al. 2013	9
9	Li et al. 2008	288	26	Lahiri 2013	1
10	Ye et al. 2008	11	27	Tsai and Hsu 2014	5
11	Tsai et al. 2008	74	28	González-Benito et al. 2014	4
12	Jermias 2008	56	29	Jones and Linderman 2014	3
13	Ju and Zhao 2009	43	30	Navarro-García et al. 2015	0
14	Briggs et al. 2010	23	31	Baber and Upadhyay 2015	0
15	O'Cass and Weerawardena 2010	65	32	Chen Y. et al. 2015	0
16	Lee and Wong 2011	14	33	Chen C.X. et al. 2015	2
17	Tsaur and Wang 2011	5			

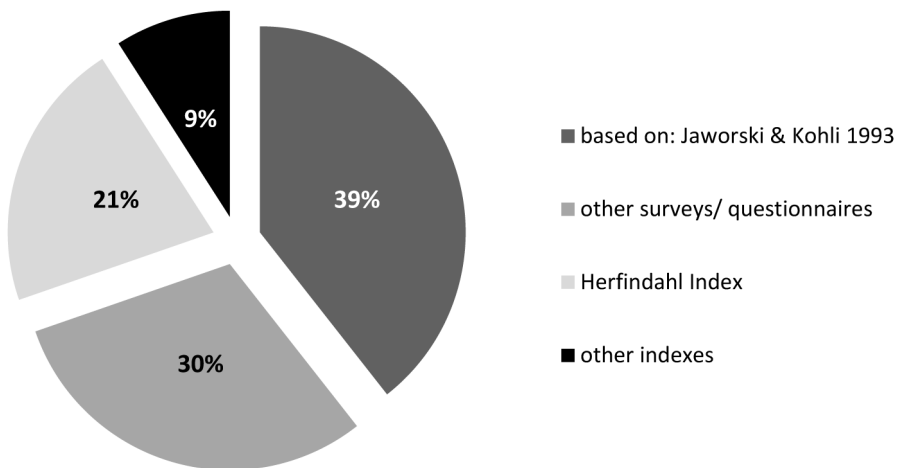
Source: own study.

Measuring the intensity of competition

The analysis conducted on the basis of a systematic literature review indicates that the most common approaches to measuring the intensity of competition can be classified into four main groups:

- Measurements based on a questionnaire survey in accordance with the approach proposed by Jaworski and Kohli (1993)
- Other measurements based on a questionnaire
- Measurements based on the Herfindahl-Hirschman index (HHI)
- Other measurements based on quantitative indexes pertaining to the market share or the number of competitors.

Figure 3. Approaches used for measuring competition intensity



Source: own study.

Measurements based on the market share, for example the Herfindahl-Hirschman Index, or on the number of entities (competitors) in the sector quite clearly indicate the use of structural variables. Research based on primary sources, with questionnaires, can contain questions about both structural and behavioural variables, and therefore present a significant advantage. In the approach based on secondary sources, it is extremely difficult to examine the behaviour of market actors, as basic variables represent relatively easily accessible information on the number of entities and their market shares. This approach is represented by several authors who, for some reason, evaluate quantitatively the strength of competition within a market. Further discussion on measuring the intensity of competition will be based, *inter alia*, on the division

into measures depending on the number of competitors and the market share, as well as research conducted with the use of questionnaires.

Quantitative measures based on the number of companies and the market share

The measure that takes into account the number of entities (competitors) in the systematic literature review carried out for the purposes of this publication is referred to in 4 out of 33 publications. Authors regard it mainly as complementary to more complex indexes (Wu, 2012; Jankowska and Bartosik-Purgat, 2012), which is also confirmed by the procedure used in the literature review, without indicating a single publication in which it would constitute a single method of measuring the intensity of competition. The number of competitors is most commonly used in conjunction with the Herfindahl-Hirschman Index (Li et al., 2008; Vroom and Gimeno, 2007), as well as multi-dimensional indexes of competition intensity (Ye et al. 2008), or even as one of the points in the questionnaire (Tsaor and Wang, 2011).

Porter (Porter, 1990) is one of those authors who point to the number of companies operating within a particular market as being a key factor determining the strength of competition. He examined the matter through reference to the number of rivals in selected sectors of the Japanese or Italian economy. However, this measure, especially in the era of globalization and the enormous dynamics of economic changes, seems to be an oversimplification, which may distort the actual evaluation of the intensity of relationships between competitors. Porter himself later claimed that a more comprehensive approach to assessing the strength of competition was necessary (Porter, 1992; Ye et al., 2008).

Ample evidence confirms that competition among fewer companies within a specific market can be far fiercer than competition among a larger number of entities. A good example are two competing petrol stations in a small town, whose owners may change the price of petrol or other products sold as frequently as several times a day, as compared to seven branches of different commercial banks operating within a specific area. Banks are much less likely to interact directly and fight for customers (the market), even if they are more numerous than the petrol stations mentioned above. In order to carry out a detailed analysis, we would need to take into account sector-specific differences or the global strategies of competing entities, which – together with the ownership policy – would allow for a more objective assessment. However, this example clearly shows the weakness of evaluations based on the number of entities as a parameter of competition intensity.

Another parameter – more complex than the number of entities – is the market share, which in itself represents only part of the market (defined by the value, number of entities or other characteristics) that an undertaking has in relation to the whole. When analysed in a static manner, it has little cognitive value for studies pertaining to the intensity of competitive relationships between companies in a given market. Information about the number of actors and their market shares can also be used to create additional indexes, for example measuring a firm's competitive intensity as the market share held by its competitors divided by the number of competitors (Wu and Pangarkar, 2009).

It is nearly impossible to surmise the intensity of competition on the basis of market share alone, as the share may result not only from a firm's independent market activity, but also from administrative decisions. A perfect example is PKN Orlen SA (Petrochemia Plock SA at the time), whose network of petrol stations increased abruptly in 1999 from approx. 640 to over 2,000 following the liquidation of the state-owned company Centrala Produktów Naftowych S.A. (Bochen et al., 2015). As a consequence, PKN Orlen's share in the fuel market increased from 10% to over 30%.

An indicator that is popular among researchers and analysts, and based on the market share held by competitors, is the Herfindahl index mentioned above; it is an indicator of market concentration (Wu, 2012; Becker and Dietz, 2004; Dansby and Willig, 1979). The Herfindahl index takes into account the market shares of individual actors or, more accurately, the sum of the squares of these shares (Jermias, 2006; Vroom and Gimeno, 2007; Bajtelsmit and Bouzouita 1998). HHI was referred to in eight publications selected as part of a systematic literature review – in seven as the basic measure of competition intensity. Some researchers use HHI to measure the strength of competition, despite being fully aware of the fact that it is a measure of concentration (Jermias, 2008; Vroom and Gimeno, 2007; Jermias, 2008; C.X. Chen et al., 2015), while others use HHI for measuring competition intensity (Li et al., 2008). HHI is used by researchers in various forms: both traditionally (Vroom and Gimeno, 2007) and in its reverse version (1-HHI), as evidenced by several studies included in the literature review (Ju and Zhao 2009; Chen et al., 2015; Jermias, 2008). The Herfindahl-Hirschman Index can also be used as a square root of the standard HHI (Lemaire and Lemaire, 1998).

The popularity of this measure is due to both its simplicity (as in the case discussed above) and importance following its inclusion in the provisions of the anti-monopoly law, both in the US and in the European Union – among others by the Energy Regulatory Office (Kamiński, 2012). Its simplicity is due to easy access to information needed for calculation purposes, available in different kinds of reports (Ramaswamy, 2001).

Competition becomes stronger as the index value decreases (approaches 0) and, conversely, weaker as the indicator increases towards 1. The index has a significant drawback related to the interpretation of results, especially in the case of a high asymmetry of market share among companies.

Although it is quite commonly used to assess the strength of competition, it seems correct to assume that the Herfindahl-Hirschman Index – which is the most easily quantifiable concentration measure – describes the market structure, which affects the behaviour of entities operating within a given market (Jackowicz and Kowalewski, 2002). It is only following a specific competitive behaviour in the market that the intensity or strength of such behaviour seems suitable for assessment. HHI should therefore not be treated as a direct measure of competition intensity, but only as a measure of concentration which – next to the diversity of products, types and sizes of entry barriers – describes the market structure. In addition to HHI, less frequently used concentration measures are:

- Lerner index (Souare, 2013; Fischer and Kamerschen, 2003),
- measures based on the concentration curve: m-firm concentration ratio (Kamiński, 2012), Rosenbluth index (Jackowicz and Kowalewski, 2002),
- Lorenz curve (Abramo et al., 2012),
- Gini index (Abramo et al., 2012),
- Hannah-Kay index (Lijesen et al., 2002),
- Theil's entropy index (Lijesen et al., 2002; Moothathu, 1990).

The above, however, are not measures of competitive intensity. The Gini index, referred to as a measure of inequality in the distribution of a specific feature within a population, is determined on the basis of the Lorenz curve and most often used to quantify the uneven distribution of household income.

The ease of access to data is an undeniable advantage of the presented measure based on the number of entities in a sector or the market share, which contributes to the popularity of these indexes. Their advantage stems also from the relative simplicity of calculation and a certain kind of standardization manifested in the comparability of results. Defined limit parameters that can be reached by the various measures facilitate the comparison of results obtained by individuals within the survey population, even if, as indicated above, their interpretation is not always clear or useful.

Using concentration measures or the uneven distribution in order to study the intensity of competition involves, however, the risk of falsely objectifying reality through

the omission of relevant variables and the simultaneous overestimation of other variables that have no direct impact on the intensity of inter-organizational relationships. This is due mainly to their actual purpose, which should be limited to the structural characteristics of a specific industry or sector. On the basis of information about the number of entities, it is not possible to conclude whether these entities engage into intensive competition among themselves. One can only determine their number, even if it does not suffice to evaluate whether this number is large or small, as the definition of “size” is subject to different interpretations depending on the market structure and definition. It is therefore clear that their contribution to the measurement of competition intensity is limited, even if they may prove to be a sort of complement to other measures.

Measures based on studies conducted on the basis of a questionnaire

Studies pertaining to the intensity of competitive relationships with the use of primary sources (questionnaires) are a popular solution among those based on both structural and behavioural variables. In the majority of cases, they yield interesting results that allow for more accurate conclusions to be drawn than from those analyses that are based solely on previously discussed measures. The analysis conducted in the framework of a systematic literature review shows that in 69% of the 33 publications, research techniques pertaining to competition intensity were based on a questionnaire.

The most frequently invoked approach to measuring competition intensity among all publications identified within the procedure is the study described in the article entitled *Market Orientation: Antecedents and Consequences* (Jaworski and Kohli, 1993). Among the 23 publications based on questionnaires, researchers cited it in 57% of cases. The study by Jaworski and Kohli enjoys great popularity, as evidenced by the 6,670 citations at the end of June 2015 (according to Goggle Scholar). Using the 5-point Likert scale, the authors asked respondents to assess 6 statements regarding the perception of competition:

- Competition in our industry is cutthroat.
- There are many “promotion wars” in our industry.
- Anything that one competitor can offer, others can match readily.
- Price competition is a hallmark of our industry.
- One hears of a new competitive move almost every day.
- Our competitors are relatively weak.

The approach presented by Jaworski and Kohli has been used by researchers in a variety of manners. Some of them refer to all of the proposed statements contained in the article published in 1993 with a 5-level Likert scale (Auh and Menguc, 2005). Others use only a few of the six statements, maintaining evaluation based on the 5-level Likert scale (Tsai and Hsu, 2014; Y. Chen et al., 2015). Other researchers have modified both the original statements and the method of evaluation, using a 7-level scale (Leonidou et al., 2013; Cui et al., 2005; Wieseke et al., 2012; Chan et al., 2012) or a 6-level scale (Tsai et al., 2008).

The approach proposed by Jaworski and Kohli refers both to structural factors and behavioural problems, thus affecting the frequency of relations and their “depth”. Statements or questions formulated in a specific manner allow researchers to know the views of those directly involved in market competition. At the same time, we can find numerous examples indicating the existence of a strong correlation between research based on the subjective opinions of experts and those on so-called hard objective data (Narver and Slater, 1990; Dess and Robinson, 1984; Pearce II et al., 1987). Depending on market structure, the stage of company development or subjective impressions of respondents (mostly executives), the feedback can be used for formulating a fairly precise and sectional evaluation of a given characteristic feature: in this case, the intensity of competition. It is essential to ensure that questionnaire-based research is conducive to thoroughly grasping the issue. If we want to investigate the intensity of a phenomenon, we can ask about the frequency or depth of the relationship, or simply request that respondents formulate their opinions on the intensity or strength. This constitutes a fundamental difference as compared to previously discussed indicators based on structural variables.

Other authors cited by researchers in the context of investigating the intensity of competition are Lusch and Laczniak, who point out that measurements based on the number of competitors or concentration indexes are, indeed, possible, but they suggest an approach based on a wider range of factors (Lusch and Laczniak, 1987). The proposed variables include, *inter alia*, cooperation between suppliers and prices of substitute products. Finally, using the 5-stage Likert scale, they included in the questionnaire three statements that were subject to verification:

- Firms will be spending more of each sales’ dollar on marketing, due to increased competition.
- Firms in our industry will be aggressively fighting to hold onto their share of the market.
- Competition will be more intense.

In another study, based *inter alia* on the assumptions proposed by Lusch and Luczniak, the intensity of competition is described as the managers' perception of competition, which the company faces on both the domestic and global market (Mahapatra et al., 2012). Export managers' perception of the level of competition in export markets has been the subject of a separate study involving 830 companies from the UK (Boso et al., 2012). On the basis of a 7-point scale, the authors measured the intensity of competition. The level of violence in relations among competitors was also measured and presented in the form of statements rated from 1 (not at all) to 7 (extremely):

- We typically adopt an “undo-the-competitor” posture in our export markets.
- We take hostile steps to achieve export competitive goals.
- Our actions towards export competitors can be termed as aggressive.

The intensity of competition may be associated with the level of aggression (hostility) between competitors, which means that intense competition represents a high degree of hostility (Bengtsson et al., 2010). Expressions pertaining to the reaction of market players and attitudes – such as hostility – make it possible to examine the behaviour of competitors – often on the basis of behavioural variables.

In a number of surveys, respondents answered questions typical of structural variables, derived from secondary sources. In one such study (Tsaur and Wang, 2011), managers of Taiwanese travel agencies, linked through alliances with other firms in the tourism sector, answered simple questions about their competitors in terms of:

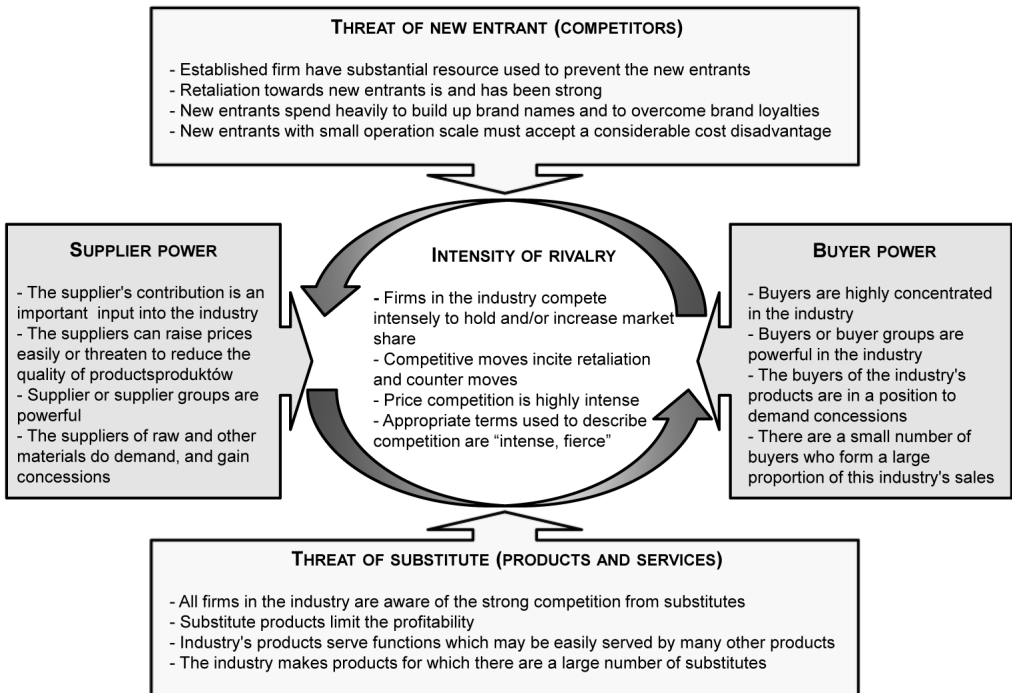
- Number of competitors,
- Competitive prices,
- Intensity of rivalry between competitors.

Answers were based on the 5-point Likert scale, from “very low” to “very high”. This is an example of a study, which – despite the obvious characteristics of structural variables, which are easily measurable using simple quantitative parameters – was carried out on the basis of interviews with respondents, which were a source of additional information.

A special method of obtaining primary data for assessing the intensity of competition through structural variables are surveys reflecting the sector's five forces according to Porter (Porter, 1991). Among the selected publications, two implement this approach to answering the question about the intensity of competition (O' Cass and Ngo, 2007; O' Cass and Weerawardena, 2010). In both cases, 20 and 25 statements relating to the

five market forces were used, thus forming a structural measure of competition intensity (Figure 4). The prototype for these analyses was a study taking into account as many as 42 statements used for the assessment of the five forces (Pecotich et al., 1999).

Figure 4. Examples of using structural variables for measuring the intensity of competition in the questionnaire-based method



Source: own study based on: O'Cass and Ngo (2007); Porter (1992).

The high level of symmetry or similarity discussed earlier can lead to intense competition and dynamic relationships based on frequent movements and reactions between competitors (Bengtsson et al., 2010). That frequency of relations is considered to be one of the basic behavioural factors in assessing the intensity of both competition and cooperation. In special cases, e.g. in the well-documented area of public tenders, the frequency of relationships can provide a quantitative measure of competition intensity. The index expressed as the ratio of the actual number of competition cases (the number of calls for tenders in which a firm participated) to all possible cases (total number of calls for tenders in which the company was able to compete in a certain period) is a measure of competition intensity (Chien and Peng, 2005). The availability of variables for this measure is, however, limited only to competition in the framework of public tenders.

The frequency of relations can also be measured using a suitable scale in a questionnaire, through the evaluation of relations depending on their frequency. In the study of relations (both competition and cooperation) between the authorities of 31 cities forming the region of Orlando, Florida, initially a scale from “0” to “5” was used in the study, where “0” = no interaction, “1” = once year, and “5” = daily interactions (Lee et al., 2012). However, researchers finally decided to change the approach and use binary variables, where “0” = no interaction and “1” = once a year or more. In the same study, authors also asked for feedback on predispositions regarding the intensity of competition and cooperation with the authorities of other cities participating in the survey. Answers ranged from “0” (no) to “4” (to a large extent).

An interesting addition to the presented approaches to examining the strength of competition – even if it is not a direct tool used for verifying the intensity of competitive relationships – may be examining consumer behaviour with the use of penetration and duplication indexes (Dawes and Nenycz-Thiel, 2013). Briefly speaking, the penetration index pertains to the percentage of consumers (examined units), who bought a product of a given brand within a specific period. The duplication index for a given brand (company) is the percentage of respondents who – while choosing a different primary brand – also selected a particular brand. As a result, the higher the ratio of the average duplication index to the average penetration index, the stronger the competition, even if this measure describes rather the behaviour of buyers than the intensity of competitive relationships.

Conclusion

Relations based on competition – just as those based on cooperation and competition – must be properly parameterized in order to allow for the use or increase of goodwill. Structural and behavioural variables that correspond to the main management trends describe inter-organizational relationships, while the nature of competition is expounded in terms of intensity (Bengtsson and Kock, 2000). It is necessary to assign to relations appropriate methods of measuring intensity, as it will help determine the intensity of individual relations and understand their interactions. Authors have formulated numerous proposals for measuring the intensity of inter-organizational relations, but the literature review shows that a questionnaire remains the most popular tool. However, it should be noted that the various measures of the intensity of competition can be reliable or not depending on the specific needs or restrictions, as available budget or time. Understanding the existing methods of measuring the intensity of competition will allow researchers and business practitioners to use them intentionally, eliminat-

ing errors resulting from improper selection of tools to the object and purpose of the research, which affects the accuracy of the measurement. These measures of competition intensity have been assembled and presented in the form of a table (Table 3).

Table 3. Examples of measures of competition intensity

Indicators/ variables	Literature
Measures based on secondary sources (indexes)	
<ul style="list-style-type: none"> ▪ Number of competitors and market share ▪ The ratio of market share against the number of competitors ▪ The log of the total sum of average competition it faces in all its participating product markets ▪ Time required to replace a supplier 	Wu 2012; Ang 2008; Porter 1990; Wu, Pangarkar 2009; Jankowska, Bartosik-Purgat 2012; Mudambi, Helper 1998; Lemaire, Lemaire n.d.
<ul style="list-style-type: none"> ▪ Herfindahl index (HHI); transformed HHI ▪ m-firm concentration ratio ▪ Lorenz Curve ▪ Concentration Curve ▪ Theil's Entropy Index ▪ Gini Index ▪ Lerner Index 	Wu 2012; Mahapatra et al. 2012; Becker, Dietz 2004; Ramaswamy 2001, Kamiński 2012; Moothathu 1990; Jackowicz, Kowalewski 2002; Bajtelsmit, Bouzouita 1998; Dansby, Willig 1979; Lemaire, Lemaire n.d.
<ul style="list-style-type: none"> ▪ Penetration coefficient and duplication coefficient 	Dawes, Nenycz-Thiel 2013
Measures based on primary sources (surveys)	
<ul style="list-style-type: none"> ▪ Competition in our industry is cutthroat. ▪ There are many "promotion wars" in our industry. ▪ Anything that one competitor can offer, others can match readily. ▪ Price competition is a hallmark of our industry. ▪ One hears of a new competitive move almost every day. ▪ Our competitors are relatively weak. 	Jaworski, Kohli 1993 Tsai, Hsu 2013; Wu 2012; Tsai et al. 2008; Auh, Menguc 2005; Leonidou et al. 2013; Tsai, Hsu 2014; Y. Chen et al. 2015; Chan et al. 2012; Wieseke et al. 2012;
<ul style="list-style-type: none"> ▪ Firms will be spending more of each sales dollar on marketing due to increased competition. ▪ Firms in our industry will be aggressively fighting to hold onto their share of the market. ▪ Competition will be more intense. 	Mahapatra et al. 2012 Lusch, Laczniak 1987
<ul style="list-style-type: none"> ▪ We typically adopt an "undo-the-competitor" posture in our export markets ▪ We take hostile steps to achieve export competitive goals ▪ Our actions towards export competitors can be termed as aggressive ▪ Our export markets are noted for competition between companies ▪ There is substantial competition among companies in our export markets ▪ Competition among companies in our export markets is intense 	Boso et al. 2012

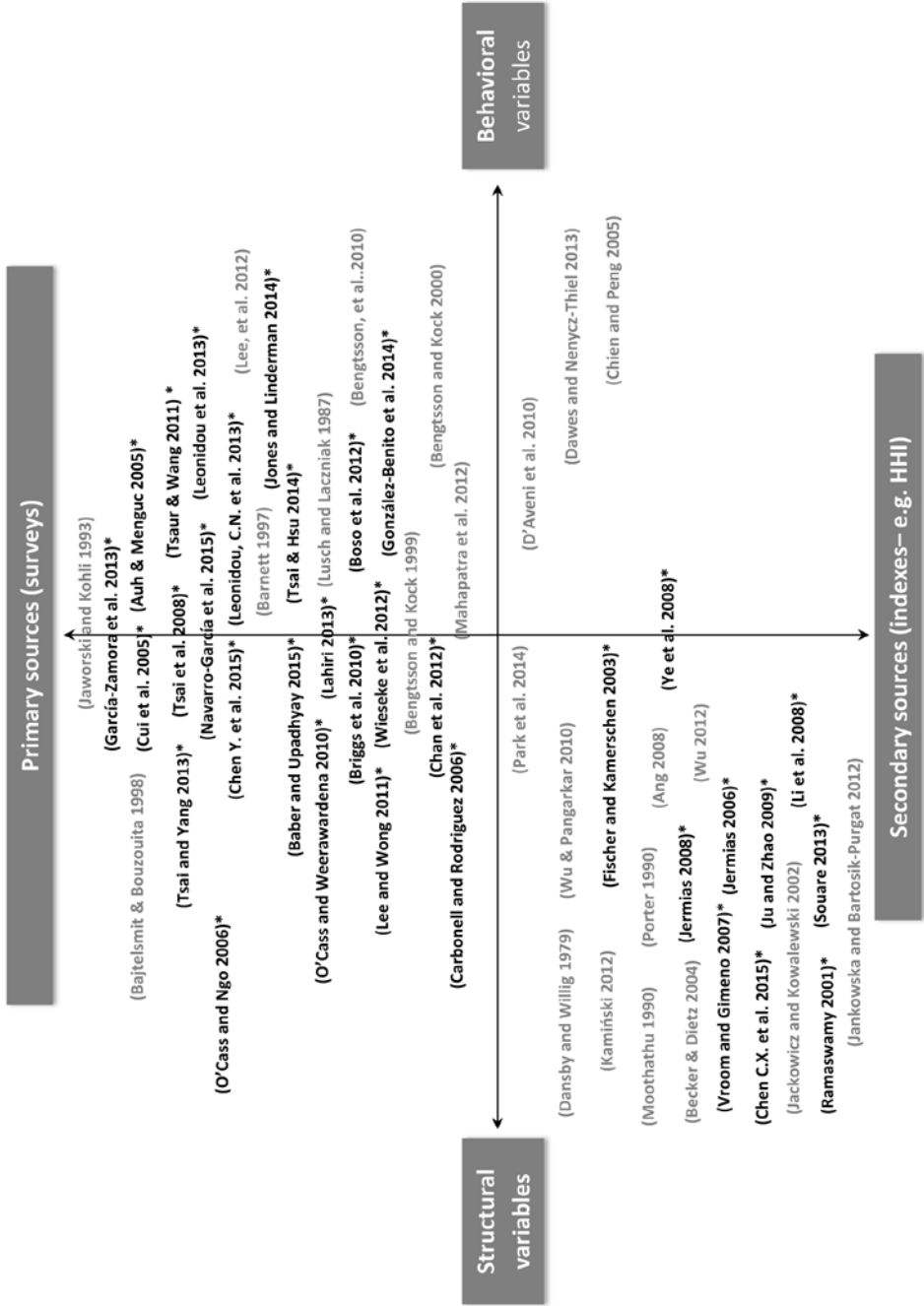
The questionnaire-based method including structural variables reflecting the sector's five forces according to Porter	O'Cass, Ngo 2007; O'Cass, Weerawardena 2010
<ul style="list-style-type: none"> ▪ Number of competitors. ▪ Competitive prices. ▪ Intensity of competition (subjective assessment of respondents) ▪ The similarity between competitors, products and markets. 	Tsauro, Wang 2011; Wang, Zajac 2007; Park et al. 2014; Porter 1990; Bengtsson et al. 2010; Wu, Pangarkar 2009;

Source: own study.

Literature used for the purposes of this study is presented in Figure 5, with publications selected for the systematic literature review marked with an asterisk (*). The discussed publications have been represented on a graph in accordance with the variables (structural or behavioural) selected by authors, as well as the chosen methods, tools and sources (primary, for instance, for questionnaires and secondary for indexes such as HHI). The distribution outlined along the vertical axis reflect a rather objective assessment of data sources – referred to publications (characterized in a binary system as primary and/or secondary). Meanwhile, the distribution along the horizontal axis representing the variables used (from structural to behavioural) stems from the author's subjective assessment. The figure clearly shows concentration around two areas typical of the most common approaches to measuring competition intensity. The area with the greatest number of publications refers to mixed structural and behavioural variables used in studies based on questionnaires. A slightly smaller density is observed in the approach using indexes based on secondary sources, such as the Herfindahl-Hirschman Index (HHI).

The structural approach, which often refers to factors beyond the control of the entity (actor), is a starting point for taking action and applying behavioural variables. Concentration measures, just as many structural measures, are derived mostly from secondary sources, and are therefore easier to access, which is their obvious advantage over behavioural variables. They are not, however, suitable for measuring competition intensity among market operators. A significant drawback of structural variables used for assessing the strength of the relationship is, therefore, the risk of a false objectification of reality, and it is therefore justified to use them rather than to describe the structure of the market, which only later affects the behaviour of entities operating within it. However, we must not underestimate the importance of tools for measuring the degree of concentration or the level of inequality, while bearing in mind their intended purpose, i.e. what they are supposed to measure and what should be excluded from the scope of their interpretation.

Figure 5. Selected publications pertaining to measures of competition intensity – an attempt at classification according to variables and data sources



* publications selected for the systematic literature review
Source: own study.

In the actual assessment of competition intensity, it is of utmost importance to take into account the method of proceeding, the level of activity, the depth and frequency of these relations, i.e. all characteristic features of the operators' behaviour. Such variables should preferably be measured through primary research, using suitable questionnaires. In the context of future research, we should consider dividing the intensity vector into at least two variables, such as the frequency of relationships and their strength (measured for instance against the background of subjective experts' opinions). An answer to the question about the frequency of interactions conducted in conjunction with the standardization of results would help compare the strength of the phenomenon between the entities and demonstrate the absolute dimension of competition intensity. This approach preserves the consistency and coherence between the object of the research and the selection of appropriate tools and measures. In addition to examining the frequency of interaction, it seems interesting to explore the intensity of competition as contingent on the distance between market players; this can be classified as the depth of relations. The aim is to identify those areas of companies that are particularly exposed to intense competition due to their proximity to customers (such as direct marketing or customer service), and those in which the strength of competitive relations is lower due to a greater distance to the market and to customers (Bengtsson and Kock, 2000).

Given the complexity of the debate on the intensity of competition, the most appropriate method seems to be the mixed approach (Chen, 1996; Weerawardena et al., 2006; O'Casey and Weerawardena, 2010; Leonidou et al., 2013; Navarro-García et al., 2015), allowing a comprehensive examination of the intensity of inter-organizational relationships, containing elements of both structural and behavioural variables (Jaworski and Kohli, 1993), with a particular emphasis on the role and nature of the latter.

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