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The Measure of Concentration of Audit Markets in Public Interest Entities in the Czech Republic and Slovakia

Pavlína Dostálová[1], Lucie Formanová[2], Michal Mádr[3], Břetislav Andrlík[4]

Abstract

The aim of the paper is to determine whether the audit market for public interest entities in the Czech and Slovak Republic has been still concentrated and subsequently to determine the measure of concentration. The article consists of data including information from audit entities that perform statutory audit of public interest entities in the Czech Republic and Slovakia on timeline 2017–2020. On the level of competition is identified by the Herfindahl-Hirschman Index and the CR4 Index, using the revenues of statutory audit as a basis for calculating market shares. The results show that the Czech and Slovak audit markets for public interest entities have been highly concentrated, with a higher measure of concentration in the Czech Republic (HHI 0.25) than in Slovakia (HHI 0.23). The Big Four has had a market share of between 90% (Slovakia) and 95% (Czech Republic) in both countries, with the four firms have been providing up to 70% of all statutory audits within public interest entities. At the same time, KPMG and PWC have had the strongest market position. The paper provides new evidence on audit market concentration of public interest entities in the Czech Republic and Slovakia in the context of development in recent years, and thus can be the basis for a subsequent discussion of the consequences associated with high market concentration.

Keywords

Audit Market Concentration, Public Interest Entities, the Czech Republic, Slovakia

I. Introduction

Nowadays, it is very important for all types of entities to be credible in their business or public environment, including their relationship to entities, users such as business partners, banking institutions, financial administration, potential investors, shareholders, partners,

[1] Mendel University in Brno, Zemědělská 1, 613 00 Brno, Czech Republic. E-mail: 73190@node.mendelu.cz.
[2] Mendel University in Brno, Zemědělská 1, 613 00 Brno, Czech Republic. E-mail: lucie.formanova@mendelu.cz.
[3] Mendel University in Brno, Zemědělská 1, 613 00 Brno, Czech Republic. E-mail: michal.madr@mendelu.cz.
[4] Mendel University in Brno, Zemědělská 1, 613 00 Brno, Czech Republic. E-mail: bretislav.andrlik@mendelu.cz.

etc. One of the tools in the modern environment to achieve credibility is to have the financial statements audited by an independent entity. The latter is particularly important for public interest entities, as these are entities for which it is imperative that the information in the financial statements is true and fair. The external audit of financial statements of public interest entities therefore helps to protect the interests of investors, the professional public or other entities in order to strengthen their confidence and increase the level of consumer and investor protection.

Before accepting an engagement, each auditor or audit firm conducting a statutory audit of a public interest entities (hereinafter referred to as PIE) should assess whether they have an interest in the audited entity and whether there is a conflict of interest (Regulation EU No 537/2014, 2014). Act no. 93/2009 Sb. (2009) specifically in §13–14, emphasizes the need for auditor independence as an important prerequisite of the audit profession, with the related obligation to comply with the Code of Ethics by the auditor. Article 5(1) of Regulation EU No 537/2014 (2014) defines non-audit services that are prohibited to be provided by the statutory auditor or audit firm, such as:

- tax services (preparation of tax returns, calculation of direct and indirect tax, tax consultancy, etc.);
- services involving participation in the management and decision-making of the audited entity;
- keeping or processing accounting records (financial statements, accounting records, payroll);
- legal services (legal representation, general advice, etc.);
- services related to the internal audit function of the entity.

Since 2016, Regulation EU No. 537/2014 (2014) of the European Parliament and of the Council of the EU has been incorporated into Act no. 93/2009 Sb. (2009). Following this amendment, the law defines public interest entities and requires quality control of PIE auditors at least once every 3 years (Müllerová and Králíček, 2017). The essence of the regulation is to establish rules for the audit of PIEs and also to define stricter rules for auditors and audit firms auditing public interest entities. The aim of the Regulation is to ensure that these mandatory audits of the PIEs are of sufficient quality to achieve a significant increase in the quality of audits across the European Union. According to Regulation EU No 537/2014 (2014), this will lead to a more efficient functioning of the common market.

Audit in the general sense is an activity in which certain facts are observed and recognized, data are collected, then evaluated and a conclusion is drawn. The actual implementation of the audit is carried out by entities registered with the Chamber of Auditors of the Czech Republic, which are the guarantors of the independence and quality of their outputs.

The aim of the paper is to verify whether the Czech and Slovak audit market has been still highly concentrated. In order to fulfil the purpose of the paper, the paper will contain several sections. The following section will provide characteristics of the audit market with an emphasis on the degree of concentration and the associated negative consequences. The third section introduces the employed methodology. The fourth section presents the development of the degree of concentration of the audit market in the Czech Republic and Slovakia. The Conclusions section summarises the individual findings and suggests opportunities for further research.

II. Concentration in the Audit Market

In the Czech Republic, in accordance with the requirements of the European Directive, supervision of the audit profession has been established by the Public Audit Oversight Board (hereinafter referred to as PAOB). It is a legal entity which, according to Act no. 93/2009 Sb. (2009), performs public supervision and also controls the activities of the Chamber of Auditors (Müllerová and Králíček, 2017). According to Jošt (2015), by establishing these oversight bodies, the European Commission has strengthened the rights and duties of supervisors over the activities of auditors, but has also brought new information obligations for PIE auditors in relation to the PAOB. The Act defines the activities of the PAOB (Section 38 of Act no. 93/2009 Sb., 2009) and states in paragraph 2, letter m) that the PAOB checks compliance with the provisions of European Union regulations with the assistance of auditors who carry out statutory audits of public interest entities. Section 38 paragraph 2o) states that the PAOB shall monitor and report on developments in the audit market in the context of the performance of statutory audits of public interest entities, in accordance with Article 27 of Regulation EU No. 537/2014 (2014). According to it, at least 3 years are assessed in the first place:

* the risks that lead to the cessation of audit firms (quality deficiencies, etc.);
* the measure of market concentration (including for individual sectors);
* the work of audit committees;
* measures related to the risks in the first bullet.

In Slovakia, the Auditing Oversight Authority (hereinafter referred to as AOA) was established with effect from 1 January 2008 by Act no. 540/2007 Z. z. (2007). The AOA, like the PAOB in the Czech Republic, is the body responsible for the supervision of public interest entities in the Slovak Republic.

Following the 2016 audit reform, it was expected that PIE definitions in the European Union would become more harmonised and more limited, but there are still differences between European countries (Accountancy Europe, 2019). Accountancy Europe (2019) predicted a reduction in the total number of PIEs, which was subsequently confirmed by a study from Audit Analytics (2020) which reported a 35% reduction in the number of PIEs in Member States as a result of changes in the definition of PIEs (2015: 26,000 PIEs, year 2019: 17,000 PIEs).

In view of the focus of this article, which deals with the Czech and Slovak audit market, we present an overview of public interest entities in these countries. There is a wider range of PIEs in Slovakia, as can be seen in Table 1 below.

Table 1: Definition of public interest entities in the Czech Republic and Slovakia

Czech Republic	**Slovakia**
Listed companies within the European economic area	Listed entities
Banks, savings banks and credit cooperatives	Bank, branch of a foreign bank, Export-Import bank of the Slovak Republic
Health insurance companies	Insurance companies, branches of a foreign insurance companies, reinsurance companies, branches of a foreign reinsurance companies
Insurance or reinsurance undertakings	Health insurance companies
Pension companies	Asset management companies, branch of a foreign asset management Pension fund management companies, supplementary pension insurance companies Stock exchanges Railways of the Slovak Republic Entities that prepare consolidated financial statements of central administration The higher territorial units The municipality, town or city under special regulations; which it complies with the following conditions: 1. total amount of its assets exceeds EUR 100 million, the amount of the asset being the amount recorded in the consolidated financial statements of the public administration entity 2. number of inhabitants exceeds 50 000

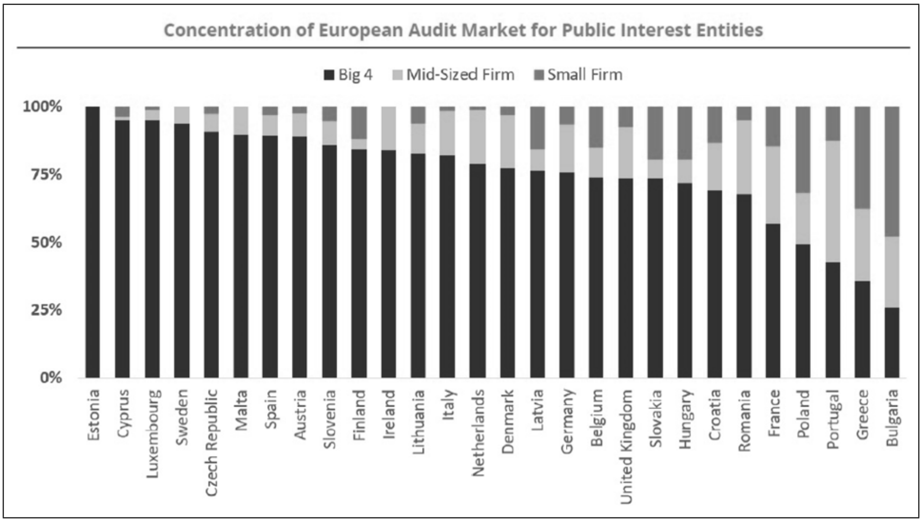
Source: Accountancy Europe (2019)

This paper also focuses on the market concentration of the audit market. High measures of market concentration are a general problem, particularly in the market for statutory audits of public interest entities. The Big Four (Deloitte, Ernst & Young, KPMG, and PwC) have a dominant position in the audit market in the Member States of the European Union. The Big Four receive a high proportion of revenue that could affect their independence, audit fees and audit quality. Thus, as Pearson and Trompeter (1994) suggest, there may be price-setting within audit leaders. The role of regulators is to monitor concentration indicators and prevent undesirable developments in the market for audit services (European Commission, 2021). On the other hand, the increased regulation of the audit profession may result in a consequent decline in audit firms auditing public interest entities, which could affect the selection of the statutory auditor or audit firm for PIEs, thereby increasing the market share of the largest firms in the sector (European Commission, 2021). The European Commission and Audit Analytics regularly issue reports on the assessment of the development of the audit market in the EU, in which the authors draw attention to the concentration in individual countries and the problems associated with it.

Audit market concentration in international research

European Commission (2021) produced the first report assessing developments in the EU market for the provision of PIE statutory audit services since the 2017 reform. The report informs on the concentration of the audit market from 2015 to 2018. The report shows that the number of audit firms auditing public interest entities in the audit market has decreased by 35%. This may be due to the fact that individual states have been able to modify their definition of public interest entities, which has led to a reduction in the number of statutory audits carried out on these entities. The report also shows that the Big Four have at least a 70% share of all statutory audits of public interest entities in thirteen EU Member States, with a combined share of 92% across EU countries. In the case of other audits, this market share ranges from 68% (statutory audits of other entities) to 85% (non-audit services). In December 2020, a summary on monitoring the audit market in Europe was released by Audit Analytics, an organisation that collects data and transparency reports on PIEs. Audit Analytics started collecting the first data on public interest entities in the EU in 2012. Today, the organisation has a unique database on PIE in each of the 28 member states of the European Union, including the UK. Figure 1 below shows the concentration of the European audit market for PIE auditors. The figure below shows that the Big Four dominate the PIE audit market in the Czech Republic and Slovakia (Audit Analytics, 2020, p. 18). In the Czech Republic, the market share of the Big Four increased by 14 percentage points to 91% in 2016–2019. This concentration is the fifth highest in the EU. In the case of Slovakia, the Big Four have a market share of around 75%, the ninth lowest in the EU.

Figure 1: Audit market concentration for PIE auditors in the EU in 2020



Source: Audit Analytics (2020, p. 18)

The issue of market concentration has been addressed by Eshleman and Lawson (2017), who found a link between audit market concentration and higher audit fees, where higher fees are a necessary condition for focusing on audit quality. Concentration is associated with higher audit quality for first year engagements, provided the auditor has a high assurance of acceptance *"... is associated with higher audit quality for first year engagements, but only if the auditor does not lowball on the engagement"* (Eshleman, Lawson, 2017, p. 73). High barriers to entry into the audit market, i.e., professional knowledge to practice the profession or regulatory requirements, lead to a typical oligopolistic market structure for the audit market. Concentration favours major oligopolistic firms and increases profits for individual firms in the industry (Loison, Belze and Hottegindre, 2020). Dunn, Kohlbeck and Mayhew (2011) examine consolidation from the Big 5 to the Big 4 with implications for audit market share equality. The authors concluded that while overall market concentration increased, the Big 4 had more equivalent market shares than the Big 5 before consolidation. The four largest clients in the market preferred to share the same auditor after consolidation, suggesting that these clients faced forced auditor selection. The number of auditors from which clients could choose was reduced. The authors also mention that this consolidation may lead to increased concentration in the audit market. As reported by Bae and Lee (2013), individual firms in the Big Four are not substantially different, but their difference in size is related to the quality of audit provision and audit fees. Research results show that larger audit firms charge significantly higher fees than their competing smaller firms. Another research that looked at the relationship between supplier concentration and competition in auditing services is the research by Pearson and Trompeter (1994). Data for the research comes from 140 life and health insurance companies. Concentration is also negatively associated with fees. A higher measure of concentration is associated with a higher level of price competition, which is assumed by most oligopoly theories. Greater market dominance then gives market leaders more power in setting prices. Research has found (Pearson and Trompeter, 1994, p. 130) that *"... clients are less likely to receive a fee cut when they switch from an auditor that is not a market leader to one that is."* High concentration may be the result of a client's preference for an auditor with professional qualifications. Tolleson and Pai (2011) addressed the issue of the market power of the Big Four accounting firms with respect to the size of these firms and how this may affect moral hazard. Rotation of audit firms is seen as something that can be a step towards eliminating moral hazard in the audit market. The characteristic of an oligopoly is interdependence. Each Big 4 firm has to take into account the reactions of its rivals (the other Big 4 firms), which means that when a Big 4 firm sets new prices or provides new services, the other Big 4 firms have to adapt. Firms with a lower market share can more easily follow the pricing policy set by the dominant firm.

Research carried out in the UK, Germany and the US has shown an oligopolistic market structure consisting of companies belonging to the Big Four. British research by Beattie, Goodacre and Fearnley (2003) demonstrates the dominance of the Big Four in the market for audit services, where they account for 96% of the market share. In the case of the US research (U.S. Government Accountability Office, 2003), the high measure of market concentration is considered to be due to the fact that there are very strict barriers for

auditors to enter the market of listed companies. Research by Bigus and Zimmermann (2008) focuses on concentration in the German audit market. The data base for the research was the financial statements of listed companies with a focus on audit fees since 2005. The research concluded that the Big Four have an oligopolistic market structure and account for 87% of total audit fees, with a lower measure of concentration than, for example, the US or the UK. PwC is considered the main market leader in Germany.
Beaubrun and Brown (2019) tracked transparency reports in the UK, France and Germany between 2014 and 2017. In France, there were 10 firms auditing 90% of the PIE market in 2017. Within the UK, this number was consistent at 7 to 8 firms, representing 90% of the PIE audit market. In all cases, as expected, the Big Four perform. In Germany, there was a significant increase in PIE in 2015–2016, which is related to the implementation of Regulation EU 537/2014 (2014). Despite this sharp increase, the number of firms auditing 90% of the PIE market was very similar in 2016–2017 (7 firms).

Table 2: Audit firms auditing PIEs in Germany, UK and France

Who audits 90% of PIE?		
Germany	**United Kingdom**	**France**
Baker Tilly	BDO	AGN International
BDO	Crowe Global	Crowe Global
Deloitte & Touche	Deloitte & Touche	Deloitte & Touche
Ernst & Young	Ernst & Young	Ernst & Young
KPMG	Grant Thornton	Grant Thornton
Nexia	KPMG	KPMG
PricewaterhouseCoopers	Mazars	Kreston International
	PricewaterhouseCoopers	Mazars
		PricewaterhouseCoopers
		RSM Global

Source: Beaubrun and Brown (2019)

Another research in the context of market concentration analysis was the research carried out in Latvia. The aim of this research was to examine the current state of the Latvian audit market and the expected changes based on the new European audit reform. According to this research, a high measure of market concentration (based on audit firm revenues) has been identified in Latvia, with the top 10 firms and the Big Four covering over 80%, including 66% of the aggregate turnover of firms with a current turnover of over EUR 23,000 (Rozgina, 2018). Rozgina (2018) mentions that Latvian audit firms are non-transparent, with only 8 of the top 10 firms publishing a transparency report, while 7 audit firms in the top 10 provide information on PIE statutory audit returns. Commercial banks are audited only by the Big Four, with six commercial banks out of 16 not having changed auditors in over 15 years. Revenue analysis for the Big Four also shows an increasing share of revenue from non-audit services (62% in 2017).

Another research that has been conducted is the research on market concentration of audit services in the Republic of Serbia by Mijić, Jakšić and Vuković (2014). The authors selected the Herfinadahl-Hirschman index and CR as the main indicators to measure concentration, considering four independent variables: operating income, net earnings, number of employees and number of audit clients. This research covered the period 2008–2011. Mijić, Jakšić and Vuković (2014) report that the HHI (0.12) and CR 2011 (65.56%), i.e., more than 2/3 of the total operating revenues were common to the Big 4 and had higher audit fees than other audit firms. For the other variables, in the case of concentration measurements, the Big Four were not dominant.

Šindelář and Müllerová (2016) worked with information on the audit market in the Czech Republic and conducted an analysis of the market concentration of the largest audit firms auditing public interest entities. The results were then compared with international research from the UK, Germany and the USA. The research questions were designed to verify whether the market meets the criteria of an oligopolistic structure and whether the requirements of European legislation can be applied to it. The data for the research was based on transparency reports of individual audit firms from 2011–2014. In 2014, 41 audit firms were included. As a basis for the calculation of market concentration, the item audit fees were selected from the companies' reports and included both fees for statutory audit and fees for other assurance engagements. In comparison with other research around the world that has looked at market concentration, the authors took into account the fact that their research drew data from listed companies and considered "statutory audit fees" as the main source of data. However, Šindelář and Müllerová (2016) could not use these listed companies due to their insufficient number in the Czech Republic. Table 3 below presents the study by Šindelář and Müllerová (2016) and the variation in the data examined in international analyses of market concentration – the UK market (Beattie, Goodacre and Fearnley, 2003)), the German market (Bigus and Zimmermann, 2008), and the US market (U.S. Government Accountability Office, 2003).

Šindelář and Müllerová (2016) states that during the research period 2011–2014 there was no significant merger between Czech audit companies and therefore no significant change in market concentration. Šindelář and Müllerová (2016) stated that compared to international research in Germany or the UK, the Czech audit market shows a lower measure of market concentration, which may be due to the fact that transparency reports were used as data rather than reports from the accounts of listed companies. Thus, according to Šindelář and Müllerová (2016), the Czech audit market shows elements of an oligopolistic market structure, with the largest companies on the market providing 84% of audit services.

Table 3: Different data bases in international studies compared by Šindelář and Müllerová (2016)

Studies	Database	Country of research	Analysed year	Market share measured by	Dominant audit firm
Šindelář and Müllerová (2016)	Data from audit firms	Czech Republic	2014	Fees for audit services	KPMG
Bigus and Zimmermann (2008)	Financial statements of listed companies	Germany	2008	Total fees	PWC
U.S. Government Accountability Office (2003)	Data from listed companies	U.S.	2002	Total fees	DELOITTE
Beattie, Goodacre and Fearnley (2003)	Financial statements of listed companies	GB	2002	Fees for audit services	PWC

Source: Beattie, Goodacre and Fearnley (2003), Bigus and Zimmermann (2008), Šindelář and Müllerová (2016) and U.S. Government Accountability Office (2003)

As far as the analysis of the market concentration of the audit market in Slovakia is concerned, there is no research work on this topic, but the Audit Oversight Authority publishes an Activity Report and an Annual Report which it prepares every year. Specifically for 2019 (Auditing Oversight Authority, 2020), there is information regarding market quality monitoring in Chapter Two of this report, which is mandated by Article 27 of Regulation EU 537/2014 (2014). Under this chapter, the Authority monitors and assesses the measure of market concentration. Auditing Oversight Authority (2020) points out that the Slovak audit market can be considered concentrated, as in other EU Member States, in the provision of PIE audit services, based on the size of the market shares of individual audit entities. It further states that the Big Four have a market share of 91.4% and that the share is even higher for statutory audit of banks and insurance companies. The Authority considers the following to be the main factors behind the higher concentration at PIE (Auditing Oversight Authority, 2020):

* it is a specific and large entity that needs the auditor to be familiar with its business area and to have appropriate knowledge and experience;
* another factor is, for example, the parent company's decision, as the entity may be part of a large consolidated entity;
* and, last but not least, the stricter requirements imposed by the Code of Conduct or by law.

Within the Visegrad Four countries, an analysis of market concentration was carried out not only in the Czech Republic but also in Poland. Indyk (2019) conducted this analysis between 2011 and 2017, confirming the dominance of the Big Four in the Polish audit

market. The objective was to test whether mandatory auditor rotation has the ability to reduce the measure of concentration in the audit market in Poland. The Big Four in the sample represent 41% of the number of companies audited. However, the strength of the Big 4 lies not in the number of audits, but in the client portfolios these firms have. It turns out that the biggest companies on the Warsaw Stock Exchange (WSE), such as banks, investment funds and insurance companies, are audited by the Big Four. In the event that these largest public companies are forced to rotate auditors, they will appoint another Big 4 auditor, which may lead to the Big 4 strengthening their position in the market, and thus having the opportunity to potentially agree on a price.
The following Table 4 summarises international research on concentration in the audit market. Based on these authors, a research question is established whether the Czech and Slovak audit market was highly concentrated between 2017 and 2020.

Table 4: Summary of international research on market concentration

Studies	Database	Country of research	Analysed Year	Survey
European Commission (2021)	Audit revenue of audit firms	EU	2015–2018	Reduction of the number of audit firms by 35%. Oligopoly in 13 member states (Big 4).
Audit Analytics (2020)	Transparency reports	EU	2020	Dominance of the Big 4 in member states of EU (CZ, SK)
Loison, Belze and Hottegindre (2020)	268 audit firms by geographical origin of respondent and by type of firm	EU	2010	High barriers to entry into the market cause an oligopoly.
Auditing Oversight Authority (2020)	Audit firms reports	Slovakia	2019	91.4% – Big 4
Beaubrun and Brown (2019)	Transparency reports (Great Britain, France, Germany)	Germany, France, GB	2014–2017	Dominance of the Big 4.
Indyk (2019)	Audit market, large capital companies	Poland	2011–2017	Dominance of the Big 4 – large capital companies choose an audit company from the Big 4 again.

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Studies	Database	Country of research	Analysed Year	Survey
Rozgina (2018)	The annual reports of Latvia's audit firms	Latvia	2017	High concentration and monopoly on the market of statutory audit of commercial banks. Non-transparency of audit firms in Latvia.
Eshleman and Lawson (2017)	U.S. audit clients	US	2000–2013	The audit fees are related to the focus on audit quality.
Šindelář and Müllerová (2016)	Data from Czech audit firms (transparency reports)	Czech Republic	2011–2014	KPMG Oligopoly (84%).
Mijić, Jakšić and Vuković (2014)	Audit firms	Serbia	2008–2011	The audit market is slightly concentrated. The Big 4 – higher fees than the others.
Bae and Lee (2013)	Accounting firm data in The Top 100 Accounting Firms section of Accounting Today (a broad range of industries)	–	2007–2011	Larger audit companies charge higher fees than competing smaller audit companies.
Tolleson and Pai (2011)	The Big 4 accounting firms	US	–	The rotation of the auditor may lead to the elimination of moral hazard. Adjusting audit companies to pricing policy.
Dunn, Kohlbeck and Mayhew (2011)	47 industry observations and 49 industry classifications	US	2001–2007	More equal shares of Big 4 than Big 5 before consolidation. Clients were forced to choose an auditor.
Bigus and Zimmermann (2008)	Financial statements of listed companies	Germany	2008	PWC Oligopoly.

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Studies	Database	Country of research	Analysed Year	Survey
Beattie, Goodacre and Fearnley (2003)	Financial statements of listed companies	GB	2002	Dominance of Big 4 (96%) – oligopoly. PWC
U.S. Government Accountability Office (2003)	Data from US listed companies	US	2002	High barriers to entry into audit market are reason for high concentration. Oligopoly. DELOITTE
Pearson and Trompeter (1994)	140 life and health insurance companies and 101 property and casualty insurance companies	US	1982–1986	A higher measure of concentration is associated with a higher level of price competition.

Source: own elaboration

III. Methodology

The aim of the paper is fulfilled by analysing and comparing two indicators of the market concentration measure between 2017 and 2020. The research investigation is carried out using data from audit entities that perform statutory audits of public interest entities in the Czech Republic and Slovakia. The subjects of public interest entities were chosen because of availability of source data. The lists of audit firms auditing PIE in each year are obtained for the Czech Republic from the Public Audit Oversight Board and for the Slovak Republic from the Audit Oversight Authority.

In the Czech Republic and Slovakia, the following number of audit firms were registered with the Public Audit Oversight Board (2021) and the Audit Oversight Authority (data was requested by the authors) in the period under review, which planned to perform statutory audits of public interest entities in 2017–2020 (see Table 5).

Table 5: Overview of the number of public interest entities in the Czech Republic and Slovakia

Czech Republic			Slovakia		
Year	Audit firms	PIEs	Year	Audit firms	PIEs
2017	31	136	2017	34	182
2018	31	160	2018	30	152
2019	30	156	2019	27	160
2020	26	161	2020	26	171

Source: Auditing Oversight Authority (data was requested by the authors) and Public Audit Oversight Board (2021)

We base our calculations on statutory audit revenues for public interest entities. These revenues are published on the audit firms' websites as part of their transparency reports. For the purpose of comparing market concentration between the Czech Republic and Slovakia, revenues from statutory audits at PIEs in Slovakia are converted at the average EUR/CZK exchange rate for the relevant calendar year (Kurzy.cz, 2021).
The following indicators are used to calculate market concentration: the concentration ratio CR(4), i.e., the sum of the relative market shares of the 4 strongest companies in the industry, and the Herfindahl-Hirschman Index (HHI), which is expressed as the sum of the squares of the firm's market share in the industry. In interpreting and evaluating these concentration indices, we draw on research conducted by Bigus and Zimmermann (2008), Mijić, Jakšić and Vuković (2014), and Šindelář and Müllerová (2016).
In his paper, Šindelář and Müllerová (2016) refers to a study by Bigus and Zimmermann (2008) as well as the European Commission (2004), who provide an interpretation of the concentration ratio (CR4) and the HHI. Bigus and Zimmermann (2008) use different values for the US and European markets in the case of the HHI assessment. In our paper we will work only with the European interpretation (due to the focus of the paper), as shown in the following Table 6.

Table 6: Possible interpretations of CR(4) and HHI

Concentration coefficient	**Low market concentration**	**Medium market concentration**	**High market concentration**
For the 3 largest companies	CR(3) < 10%	10% < CR(3) < 25%	25% < CR(3)
For the 4 largest companies	35% < CR(4) < 50%	50% < CR(4) < 65%	65 % < CR(4)
Herfindahl-Hirschman index	**Low market concentration**	**Medium market concentration**	**High market concentration**
EU	HHI < 0.10	0.10 < HHI < 0.20	0.20 < HHI

Source: Bigus and Zimmermann (2008) and European Commission (2004)

IV. Results

The aim of our paper was to verify whether the Czech and Slovak audit market is highly concentrated. Both markets were found to be highly concentrated, with the Czech Republic having a higher level of market concentration than Slovakia. In this section we comment on the results obtained.
Table 7 shows the evolution of market concentration between 2017 and 2020 in the Czech Republic and Slovakia. The "Concentration" column represents the result of the degree of market concentration in countries, based on the interpretation of the HHI and CR by Bigus and Zimmermann (2008).
In the Czech Republic, the concentration ratio for the 4 largest companies in the sector is round 95%. In the case of the second indicator for measuring the HHI concentration, the value is always higher than 0.20. This means that the Czech Republic always achieves the same result in both indicators in 2017–2020, namely that there is a high measure of market concentration in the Czech Republic.

Slovakia has a concentration coefficient of some 90%. When comparing the concentration measure in Slovakia with the Czech Republic, both the HHI and CR(4) are lower than in the Czech Republic, but Slovakia still achieves high values. In Slovakia, the HHI was 0.19 in 2019. This means that this value is in the range 0.10<HHI<0.20 and we take it as the median level of market concentration in European terms. However, in the following year (2020) the index was again higher than 0.20.
On the basis of this section, it can be concluded that a high measure of market concentration persists in both the Czech Republic and Slovakia (both countries have similar HHI values).

Table 7: Development of market concentration in individual years in the audit market in the Czech Republic and Slovakia

Czech Republic				Slovakia			
Year	CR(4)	HHI	Concentration	Year	CR(4)	HHI	Concentration
2017	94.7%	0.24	High	2017	94.9%	0.23	High
2018	96.2%	0.25	High	2018	92.3%	0.23	High
2019	96.0%	0.26	High	2019	81.8%	0.19	Medium
2020	95.4%	0.24	High	2020	89.7%	0.23	High

Source: own analysis of data from transparency reports of relevant audit firms

Table 8 shows the evolution of Big Four procurement by public interest entities from 2017 to 2020. In 2017–2018, there is an increase in the number of public interest entities in the Czech Republic, while there is a decrease in Slovakia. The share of the Big Four auditing these entities is over 60% in both countries in 2017–2018. Within the next years 2018–2019 in the Czech audit market, there is an increase in the share of the Big Four in the audit market for public interest entities, with a decrease in the total number of these entities. Conversely, the number of PIEs increased and the share of the Big Four decreased. Higher numbers of public interest entities in both countries are indicated for 2019–2020. The Big Four's share of PIE contracts surpassed 70% in the last year of the survey in the Czech Republic, while in Slovakia it is round 66%.
The measures of concentration in the Czech Republic and Slovakia are comparable to those in other EU Member States such as Sweden, Spain, Austria or Germany (see Figure 1). These countries have a measure of concentration of round 75%. This is consistent with the report from European Commission (2021). The conclusion of German research by Bigus and Zimmermann (2008) showed that the Big Four have an oligopolistic market structure and account for 87% of total audit fees, with a higher level of concentration than in Switzerland, but at the same time slightly lower than, for example, the US or the UK. This statement is then matched by Figure 1 from Audit Analytics (2020, p. 18), where the concentration rate is higher in Germany than in the UK. The concentration in the German audit market for public interest entities is lower than in the Czech Republic, but higher than in the Slovak audit market.

Table 8: Development of Big 4 contracts on the audit market in the Czech Republic and Slovakia

Czech Republic				
Year	**Public interest entities**			**Share of individual companies from the Big 4 in %**
	Total	**Of which mandatory audit from Big 4**	**Share in %**	
2017	136	90	66.18	32.35 KMPG 13.97 PWC 11.77 DELOITTE 8.09 EY
2018	160	102	63.75	30.63 KPMG 16.88 PWC 9.38 DELOITTE 6.88 EY
2019	156	109	69.87	31.41 KPMG 21.15 PWC 10.26 DELOITTE 7.05 EY
2020	161	113	70.19	28.57 KPMG 22.98 PWC 11.18 DELOITTE 7.45 EY
Slovakia				
Year	**Public interest entities**			**Share of individual companies from the Big 4 in %**
	Total	**Of which mandatory audit from Big 4**	**Share in %**	
2017	182	121	66.48	25.82 KPMG 17.03 PWC 12.64 DELOITTE 10.99 EY
2018	152	102	67.11	26.32 KPMG 21.71 PWC 14.47 DELOITTE 4.61 EY
2019	160	106	66.25	29.38 KPMG 21.25 PWC 10.63 DELOITTE 5.00 EY
2020	171	112	65.50	32.16 KPMG 17.54 PWC 9.94 DELOITTE 5.85 EY

Source: own analysis of data from transparency reports of relevant audit firms

Table 9: Ranking and shares of dominant audit firms by audit revenues for public interest entities in 2017–2020 in the Czech Republic and Slovakia

	Audit revenue at PIEs (CZK)		Market share and order Big 4	
Year	**Czech Republic**	**Slovakia**	**Czech Republic**	**Slovakia**
2017	1 079 914 000	384 585 222	PricewaterhouseCoopers Audit, s.r.o. (32.595%), KPMG Czech Republic Audit, s.r.o. (27.317%), Ernst & Young Audit, s.r.o. (20.867%), Deloitte Audit s.r.o. (13.890%)	KPMG Slovakia spol. s r.o. (26.050%), PricewaterhouseCoopers Slovakia, s.r.o. (25.304%) Deloitte Audit s.r.o. (22.579%) Ernst & Young Slovakia, spol. s r.o. (20.977%)
2018	1 107 591 600	389 059 058	PricewaterhouseCoopers Audit, s.r.o. (30.697%), KPMG Czech Republic Audit, s.r.o. (30.517%), Ernst & Young Audit, s.r.o. (19.895%), Deloitte Audit s.r.o. (15.087%)	PricewaterhouseCoopers Slovakia, s.r.o. (30.701%), Deloitte Audit s.r.o. (23.622%), KPMG Slovakia spol. s r.o. (22.159%), Ernst & Young Slovakia, spol. s r.o. (15.805%)
2019	1 138 524 762	453 885 119	KPMG Czech Republic Audit, s.r.o. (32.762%), PricewaterhouseCoopers Audit, s.r.o. (30.478%), Ernst & Young Audit, s.r.o. (18.477%), Deloitte Audit s.r.o. (14.290%)	PricewaterhouseCoopers Slovakia, s.r.o. (24.129%), Deloitte Audit s.r.o. (22.534%), KPMG Slovakia spol. s r.o. (21.804%), Ernst & Young Slovakia, spol. s r.o. (13.365%)
2020	1 068 171 000	399 566 962	PricewaterhouseCoopers Audit, s.r.o. (31.924%), KPMG Czech Republic Audit, s.r.o. (23.217%), Ernst & Young Audit, s.r.o. (22.537%), Deloitte Audit s.r.o. (17.722%)	KPMG Slovakia spol. s r.o. (31.952%), PricewaterhouseCoopers Slovakia, s.r.o. (26.962%), Ernst & Young Slovakia, spol. s r.o. (16.751%), Deloitte Audit s.r.o. (14.031%)

Source: own analysis of data from transparency reports of relevant audit firms

Table 9 shows the market shares of the Big Four and their ranking in each year. We base this on total audit revenues for public interest entities. Based on the data presented in Table 9, the long-term trend is similar for the top two dominant firms in the audit market in the Czech Republic and Slovakia, which have equal shares. PWC and KPMG alternate the top positions in both countries. These two audit firms are therefore the most dominant in both countries, the shares of these firms in 2020 in the Czech Republic (55.14%) and in Slovakia (58.91%). According to a study by Audit Analytics (2020), these audit firms are also dominant in other EU countries. Specifically, KPMG is the dominant firm in Slovenia, Germany, Austria, Luxembourg and the Netherlands, while PWC is the dominant firm in, for example, Portugal, Greece, Croatia and the Scandinavian countries (Sweden, Finland, Denmark).

V. Conclusion

The aim of the paper was to verify whether the Czech and Slovak audit market is highly concentrated with a focus on the period 2017 to 2020. The paper is based on scientific papers by Bigus and Zimmermann (2008) and Šindelář and Müllerová (2016). The findings of our own investigation suggest that the Czech and Slovak audit market for public interest entities is highly concentrated. The audit market leaders include the Big Four, with audit firms KPMG and PWC being the most dominant of the Big Four in both markets in 2017–2020. Thus, an oligopolistic market structure has been identified in both countries, which is consistent with the analysis of the audit market in the EU by Audit Analytics (2020, p. 18, see Figure 1), and by European Commission (2021), as well as the analysis by Šindelář and Müllerová (2016) in the Czech Republic in 2011–2014, and in Slovakia from the report by Auditing Oversight Authority (2020).

Our research builds on Šindelář and Müllerová's (2016) analysis of the Czech market. Based on the results from the empirical part, we can see a longer-term trend that the audit market in Slovakia and the Czech Republic is highly concentrated. The measures of concentration in the Czech Republic and Slovakia are comparable to those in other EU Member States such as Sweden, Spain, Austria and Germany (Figure 1). In these countries, the measure of concentration is around 75%. This corresponds to a report from the European Commission (2021).

As far as the situation in Slovakia is concerned, the development of the audit market is not mapped here, which is one of the contributions of our paper. The high measure of concentration is confirmed by the Big Four's share of orders (Table 8) and share of sales (Table 9).

The Czech Republic achieves a higher concentration than Slovakia, this may be due to the different definition of PIEs in these countries. The main difference in the definition of PIE is in the case of Slovakia, which considers cities and regions to be PIE in addition to the Czech Republic, provided certain conditions are met (see Table 1). There is therefore a larger number of PIEs in Slovakia and this leads to a lower measure of concentration in this market. A public-interest entity (PIE) is a large accounting entity that needs an auditor with the appropriate knowledge and experience, as PIE accounting is more demanding and it is a large Big 4 audit firm that can afford to engage the necessary experts to audit companies such as banks, insurance companies, etc.

A study by Audit Analytics (2020) confirmed the assertion by Accountancy Europe (2019) that the number of PIEs in each country will decrease following the 2016 statutory audit reform, which was also confirmed as there was a 35% reduction in the number of PIEs across the European Union.

High market concentration can cause significant problems, for example Audit Analytics (2020) highlights the problem associated with the collapse of one of the Big Four based on Audit Analytics' Audit Market Monitoring Report for Europe. High levels of market concentration are a general problem, particularly in the market for statutory audits of public interest entities, and if the Big 4 were to be reduced to the Big 3, there could be even greater measures of market concentration. The Big Four receive a high proportion of revenue that could affect their independence, audit fees and audit quality. Pearson and Trompeter (1994) point to the risk that there may be price fixing within audit leaders.

We offer two recommendations as well as opportunities for further research. First, the negative effects arising from high market concentration should be analysed in much greater detail. Second, further research should answer the question of what opportunities exist in reducing concentration in the audit market, whether at national or European level. As a basic recommendation we can consider mandatory rotation of auditors, which could help to strengthen the fulfilment of the premise of external audit, namely the auditor's independence from the audited entity.

Limitations in the implementation of the paper include the following: data was not available for some audit companies, transparency reports were missing from the website, or the website did not exist at all. Furthermore, only audit firms were taken into account, not natural persons as statutory auditors. Some companies were found to have errors in their transparency reports or were not audited at all in a given year. As a further limitation, we can also consider international surveys, which usually take listed companies as a sample (e.g., Germany, UK). However, this was not possible in the case of the Czech Republic and the Slovak Republic, as there is a small number of listed companies on the stock exchanges in these countries.

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