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Tightening tax policy and changes to tax efficiency on the example of companies listed on the Warsaw Stock Exchange

1. Introduction

Tax efficiency is shaped by two opposed forces: (1) companies intensify behavior aiming at tax planning and (2) the legislator changes the tax law in order to seal the tax collection system, thereby increasing revenues to the state budget and limiting the behavior of companies balancing on the edges of the law. On the Polish market these two forces have collided very dynamically. The interest of enterprises in the issue of tax management has been systematically growing since 2004, as evidenced by the research conducted (Famulska, 2015) as well as reports from the specialist press on the unprecedented growth of the tax advisory market (Zalewski, 2015). At the same time, after the change of the ruling elite in Poland in 2016, some intensive legislative activities aiming at tightening tax laws have been observed. The declared goal of these changes by their legislators is: (1) tightening of the income tax system and (2) ensuring that the amount of tax paid by large enterprises, in particular international enterprises, is linked to the actual place of their income. Most of these changes effectively impacted the tax results and taxes reported by enterprises for the first time in 2018.

The impact of these changes on the behavior of enterprises and their tax efficiency is indisputable but it should be noted that there is little research on tax efficiency concerning the Polish market. Most concerns individual case studies

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and opinion polls, while quantitative research on the tax efficiency of enterprises has practically not been conducted on the Polish market as of yet.

The aim of the article is to analyze the effectiveness of income tax management among companies listed on the Warsaw Stock Exchange (WSE) and to verify the hypothesis that the changes in tax regulations introduced since 2017 have affected the tax efficiency of Polish listed companies. The author adopted the following specific research goals:

- quantitative assessment of the impact of changes in tax law introduced since 2017 on the tax efficiency of companies listed on WSE,
- identification of groups of enterprises for which the scale of the impact of legal changes on tax efficiency is the highest,
- formulation of directions for further research on tax efficiency.

The article is organized in the following manner. The first section presents the synthetic results of the research on tax efficiency to date. The second presents the research sample and discusses the methods of analysis used. The third part presents the obtained results and their discussion in two main areas: (1) changes in tax efficiency in the audited period and (2) analysis of the relationship between the observed changes in tax efficiency and selected characteristics of enterprises. The work ends with a summary in which directions for further research are proposed.

2. Review of the current state of knowledge

The global research concerning taxation are conducted in the areas of balance sheet law and tax law, economics as well as corporate finance. Hanlon and Heitzman (2010) indicate four key areas in global taxation research: (i) tax reporting, (ii) tax planning and tax avoidance, (iii) tax impact on corporate decisions, including investment, debt and eligibility, and (iv) the impact of taxation on the valuation of assets. The vast majority of empirical research focuses on the two middle ones and concerns a broadly understood notion of tax efficiency.

The literature defines many different measures of tax efficiency that support different research goals (Kowalski, 2016). The most popular measure of tax efficiency is the effective tax rate (ETR). The effective tax rate is the quotient of the income tax and balance sheet income before tax. It should be noted that the income tax presented in the financial statements includes the amount of the calculated tax liability commensurate with the results of a given period, additionally adjusted by deferred tax. As a result, if there were no permanent differences between the balance sheet and tax recognition, and no temporary differences for which deferred tax was not established, the effective tax rate should be equal to the nominal tax rate. The formation of permanent differences will result in the

ETR exceeding the nominal rate and proves the tax ineffectiveness of the enterprise. The fundamental advantage of the effective tax rate may also be regarded as its most significant disadvantage for the purposes of tax control. The emergence of temporary differences may be independent of managerial decisions, an element of tax planning or even a tool for shaping financial results (Buk, 2014). This is one of the reasons why ETR has been the subject of much criticism in the literature on the subject as a measure of tax efficiency both from the perspective of enterprises and tax authorities. Omer et al. (1991) indicate in their research examples of Fortune 500 companies that, despite their high ETR values, they have paid little or no tax over the years.

The indicated disadvantages of the effective current tax rate mean that the effective tax rate (CETR) is a measure of tax efficiency widely promoted in the literature (Heltzer, 2009). The effective tax rate of the current tax is calculated as the current income tax divided by the balance sheet income before tax, i.e. the gross result. Literature reports mention the advantages of an effective current tax rate, especially important for applications in controlling. First of all, as Graham (2013) points out, it is the measure preferred by managers. CETR is the most frequently used measure of tax efficiency used in incentive systems of people responsible for tax aspects (Armstrong et al. 2012). A positive correlation was found between the reported CETR and the share price and market value, CETR is used as a parameter in most profitable valuation models, moreover, CETR is often used in banking covenants and determines debt capacity (Graham et al., 2011).

Research on factors affecting tax efficiency has a long history in developed markets. Among the factors positively affecting tax efficiency is, among other things, the size and profitability of enterprises (Lisowsky, 2010), low indebtedness, and concentration of ownership, including family businesses (Desai, Dharmapala, 2009; Chen et al., 2010). Undoubtedly, one of the most important determinants of tax efficiency is the involvement of enterprises in tax planning (Mills, 1998; Frank et al., 2009). Lisowsky (2010) showed the relationship between tax efficiency and the number of foreign operations, the presence of entities in tax havens and the number of court disputes with tax authorities recognized as the consequences of tax planning.

The literature introduces many terms to describe the activity of enterprises focused on the analysis and further shaping of tax burdens. On the rocky poles there are terms: tax planning or tax management and tax avoidance or tax – aggressiveness, sheltering, evasion, noncompliance, etc. Some researchers have defined tax planning as exerting an active and legal influence on the amount of tax burdens (Szlęzak-Matusewicz, 2013), or an organized response of a company to the tax regulations (Poszwa, 2017). Tax avoidance is defined broadly as the reduction of explicit taxes. This definition does not distinguish between real activities that are tax-favored, avoidance activities specifically undertaken to reduce taxes, and targeted tax benefits from lobbying activities.

Global research identifies and discusses examples of tax strategies. Lisowsky (2010) distinguishes three main groups: (i) regarding increasing the value of assets, (ii) increasing costs and (iii) deferring revenues. The literature also indicates examples of tax strategies specific to Polish conditions and the tax system (Famulska, 2013, 2015; Wyciślok, 2013; Szlęzak-Matusewicz, 2013). The scale of using these strategies was examined in Poland in the form of collecting and analyzing opinions (Ciupek, Famulska, 2013), but I am not aware of quantitative research on the impact of using a tax strategy on tax efficiency. Particularly significant, and possibly the only work in recent years on tax efficiency in the conditions of companies listed on the WSE, has been the research of Sztuba (2016). The research covered the years 2008–2010 and was aimed at a comparative assessment of the level of fiscalism in Poland compared to other countries.

Tax planning is the most common reaction of enterprises to tax burdens, including changes in tax regulations. Research by Famulska (2015) on a group of 50 companies showed that the most common response to the tax burden was the implementation of a tax strategy, and not the payment of the due tax or tax evasion.

Tax efficiency is determined, on the one hand, by the attitudes of the taxpayer who strives to minimize the burden and, on the other hand, by the mechanism of imposing and enforcing taxes by the public authority. Ciupek and Famulska (2013) pointed out that tax and legal relations are a natural axis of the conflict of interests between public authorities and enterprises. In the example of the Polish market, we can observe the intense clash of these two forces.

The tax law regulations introduced in 2017 were intended to limit the use of those strategies that result from legal imperfections. A anti-avoidance clause was introduced, as well as numerous changes to the Income Tax Act (Act of October 27, 2017), aiming to tighten the tax system, among other things,: separate taxation of income from capital sources, limiting the possibility of including expenses for certain intangible services or expenses related to debt financing as tax costs. The purpose of these changes is to increase the efficiency of the tax system in Poland, and to increase income tax revenues (Wyrzykowski, 2019).

Kowalski (2017) conducted research on the tax efficiency of companies listed on the WSE in the years 2004–2014. The study showed an increase in tax efficiency of the surveyed companies in the analyzed period, but it was observed for entities with average effectiveness values. A negative correlation was demonstrated between tax efficiency and the scale of operations and profitability, which could be related to the use of tax strategies and tax management instruments. The presented study covered the years 2012–2019. The selection of the period was related to the sample analyzed in previous studies (Kowalski, 2018) and to some extent is their continuation.

3. Sample and research method

The survey covered enterprises listed on the main market of the Warsaw Stock Exchange. The analysis used annual financial statements. Data for analysis were collected from the EquityRT databases.

Efficiency is a concept that is not clearly defined, being a category used as a criterion for assessing the activity both at the level of the entire enterprise, as well as in relation to its individual areas. Efficiency is most often analyzed as a reciprocal relationship between inputs and outputs. With regard to tax efficiency, the effect will most often be expressed differently in terms of tax burden, tax loss, assets or tax liability. This value will be related to the basis of comparisons most often representing different categories of the financial result. Two measures of tax efficiency were analyzed: effective tax rate (ETR) and current effective tax rate (CETR). ETR was calculated as 'income tax' divided by profit/loss before tax presented in income statement. The main advantage of an effective tax rate is the ease of its calculation.

CETR was calculated as income tax, the current part divided by profit/loss before tax is presented in an income statement. A higher value of ETR and CETR means that the company calculates in the current and future periods (in the case of ETR), shows as an obligation to pay in the current period (in the case of CERT) more tax burdens. Thus, the higher the ETR and CERT value, the lower the tax efficiency.

Income tax was not included in financial statement presented in EquityRT data, so it was measured based on other data. First, the deferred part of income tax was calculated as delta year to year position 'deferred income tax' presented in assets in balance sheet statement and delta year to year position 'deferred tax liabilities' posted in equity & liabilities. To calculate current income tax, the income tax presented in income statement was reduced by the deferred part. The correctness of these assumptions was verified on the basis of a dozen or so companies. During the verification, the obtained result was compared with the data contained in completed financial statement issued on company web sites. CETR is a measure of tax efficiency propagated in the literature (Heltzer, 2009). Graham (2013) indicates that this is the measure preferred by managers.

The sample originally included 6,161 financial statements. Excluded from the database were banks and enterprises conducting financial activity due to different standards of financial statements. When calculating CETR, companies that recorded tax losses and did not report current tax were omitted. Ultimately, the sample included 3,416 observations for ETR and 2,215 observations for CETR. The database was supplemented with the characteristics of companies used in the further analysis (for example, industry, capitalization, auditor). The characteristics of the tested sample are presented in Table 1.

Table 1

Sample descriptive statistics

Year	N	SALES [mPLN]		EBIT [mPLN]		ASSETS [mPLN]		ROA [%]		ROE [%]		D/E [ND]		Capitalization [mPLN]	
		AVG	MED	AVG	MED	AVG	MED	AVG	MED	AVG	MED	AVG	MED	AVG	MED
2019	268	1 787.1	207.4	128.4	17.2	2 001.1	256.8	8.4	4.8	18.0	10.3	1.67	1.17	1175.5	117.1
2018	289	1 864.0	186.2	152.5	14.9	2 234.8	247.2	33.7	4.5	32.2	10.1	1.30	1.07	1162.5	105.7
2017	292	1 651.3	189.9	159.2	15.3	2 019.5	218.2	6.7	4.5	14.5	10.4	1.17	1.02	1100.7	99.7
2016	292	1 460.1	180.0	131.1	14.9	1 778.1	222.0	7.3	5.0	9.7	10.5	1.21	1.05	1112.4	97.4
2015	289	1 258.0	174.4	93.1	15.0	1 246.9	195.0	7.9	5.1	19.2	10.8	1.54	0.93	1044.0	100.6
2014	279	1 177.5	176.0	115.1	14.2	1 661.4	208.3	9.0	4.9	19.1	10.5	1.87	0.94	956.2	117.6
2013	266	1 628.1	171.5	112.1	14.0	1 773.8	195.7	6.7	4.8	13.3	9.6	1.20	0.87	920.8	122.3
2012	240	1 901.8	168.6	137.2	13.7	1 883.4	192.0	7.2	5.2	14.4	10.5	1.37	0.92	907.7	133.4

N – number of observations, AVG – average, MED – median

Then the prepared database was analyzed and statistically deduced, with the Statistica package used for the analysis.

The first part of the research was aimed at assessing whether, after the introduction of changes related to the tightening of the state's tax policy, there were cracks in the measures of tax efficiency. The analyzed sample was divided into quartiles in terms of ETR and CERT. The division was made because earlier studies showed that companies with different tax effectiveness were characterized by the strength of its changes over time.

The sample was purified from outliers. Then, the possibility of conducting an analysis of variance was verified. The Shapiro–Wilk test verified whether the distributions of each group were characterized by a normal distribution. The homogeneity of variance in each of the selected groups was then tested using the Brown-Forsythe test (Brown, Forsythe, 1974). Due to the fact that the assumptions about the normality of the distribution were not confirmed for each of the groups, further studies were carried out using non-parametric Kruskal–Wallis tests (Kruskal, Wallis, 1952). Significance of differences between the measures of tax efficiency between the distinguished classes was made using posthoc tests (Dunn, 1964).

In the next step, the scale of CETR changes in 2018–2019 was analyzed, i.e. when changes to the tax law aimed at tightening it came into force in relation to the recorded by the companies in 2016–2017. The variable Z is given for the analysis and is defined as $Z = (CETR\ AGV\ 2018–2019/\ CETR\ AGV\ 2016–2017) – 1$, where CETR AGV 2018–2019, CETR AGV 2016–2017 means the average CETR value for the company achieved in 2018–2019 and 2016–2017, respectively.

Subsequently, the relationship between Z and the characteristics of companies was tested, taking into account such features as Sales, EBIT, Assets, ROA, ROE, D/E, Capitalization. The aim of the research was to verify whether enterprises with different characteristics have different changes in tax efficiency in the analyzed period. The enterprises were grouped into quartiles of the observed measures and the defined measure Z was analyzed in each group. The same procedure as presented in the first step was carried out.

The factors positively influencing tax efficiency include: the size and profitability of enterprises (Lisowsky, 2010), low debt to equity ratio an ownership concentration (Desai, Dharmapala, 2009; Chen et al., 2010). It was analyzed whether these features may affect the level of changes in tax efficiency after the entry into force of the amended regulations. It was also analyzed whether features such as revenues from sales, CETR, profit income (EBIT), assets, debt to equity, return on assets, return on equity, capitalization, occurred. The sample was divided into groups, where a given group denoted a quartile in terms of

a given feature. The statistical significance of the observed differences was tested using the Kruskal–Willis tests.

It should be assumed that the amended regulations will affect the CETR of companies involved in aggressive tax planning. Identifying that a given company has carried out tax planning is not easy. Miles (1998) assumed that companies audited by auditors from the so-called big four are more likely to use the services of tax advisers and apply tax strategies although the correctness of this assumption may be questionable and was criticized by Frank et al. (2009). Lisowsky (2010) showed a relationship between tax efficiency and the number of investment operations that can be identified on the basis of financial statements. In addition, changes to the tax law should have a greater impact on the efficiency achieved by holding companies, on which regulations such as limiting intangible costs and internal financing costs should have a greater impact.

For this reason, in this step, the Z value was analyzed from the point of view of the characteristics of whether the company was audited by a big four auditor, whether the company created holding structures, or whether the company implemented capital investments. The aim of the research was to verify whether the indicated features affect the observed changes in tax efficiency in the analyzed period. Because the sample was divided into two groups in this experiment, the statistical significance of the obtained results was tested with the classic t statistic.

4. Results and discussion

Tables 2 and 3 present the results of the ETR and CETR values obtained during the analyzed period. The results for the entire sample and groups based on ETR and CETR quartiles are presented. Additionally, the results are presented in Figures 1 and 2.

Table 4 presents the pairwise comparison analysis. The results obtained in individual years were compared in terms of whether they differ in a statistically significant manner. The non-parametric Kruskal–Wallis tests were used for the assessment of differences in tax efficiency between the selected groups, the analysis was supplemented with post hoc Dunn tests. The obtained results indicate that for ETR there is no reason to reject the hypothesis that all groups are characterized by the same tax efficiency. However, in the case of CETR, the null hypothesis that all groups are characterized by the same tax efficiency should be rejected. Significant differences between CETR were obtained for all examined quartiles.

Table 2
ETR by years

ETR	Total			Q1			Q2			Q3			Q4		
	AVG	MED	StDev	AVG	MED	StDev	AVG	MED	StDev	AVG	MED	StDev	AVG	MED	StDev
2019	24.0	20.5	36.5	41.8	30.2	65.5	22.1	20.5	5.2	20.5	18.4	15.2	11.5	9.9	18.9
2018	35.5	20.3	161.1	78.5	29.3	307.8	20.6	20.2	5.5	21.2	19.0	15.6	21.9	17.2	87.6
2017	33.6	19.8	149.2	51.3	25.6	80.8	20.1	20.0	7.1	17.0	17.4	14.7	45.9	16.5	286.8
2016	40.2	19.5	403.4	122.5	23.7	803.8	18.8	19.5	8.3	11.2	16.3	37.0	8.3	6.8	31.1
2015	22.5	19.6	119.8	58.5	23.0	186.4	26.1	20.1	74.1	12.7	15.1	11.5	-6.8	10.5	124.0
2014	0.9	19.0	131.8	-18.9	24.1	199.8	17.9	20.2	14.4	20.9	18.4	42.5	-16.1	2.9	163.3
2013	14.7	18.9	26.7	28.0	26.4	23.9	17.9	19.9	11.5	8.0	13.5	25.0	4.8	3.0	34.7
2012	22.8	19.2	139.5	58.1	22.6	270.7	17.4	20.2	13.9	13.7	14.3	12.0	1.9	9.6	58.2

ETR in percentage, AVG – average, MED – median, StDev – standard deviation, Total – whole sample. Q1, Q2, Q3 – companies asses to first, second, third quartile of ETR

Table 3
CETR by years

CETR	Total			Q1			Q2			Q3			Q4		
	AVG	MED	StDev	AVG	MED	StDev	AVG	MED	StDev	AVG	MED	StDev	AVG	MED	StDev
2019	16.2	16.9	11.1	32.3	31.0	6.3	21.0	21.0	1.9	13.6	14.1	2.9	2.3	2.3	3.5
2018	16.2	17.1	11.7	33.2	31.5	7.6	21.0	20.9	1.9	13.4	13.7	3.1	1.3	0.4	4.0
2017	13.3	14.2	11.2	29.1	26.5	6.7	18.4	18.1	2.1	9.5	9.8	3.4	-0.6	0.5	4.9
2016	13.6	14.1	11.4	29.8	28.7	5.9	18.4	18.4	2.3	10.5	10.6	2.9	-0.7	0.3	5.2
2015	15.0	15.2	12.6	32.6	29.9	8.6	19.5	19.4	2.0	10.4	10.5	3.5	-0.5	0.1	3.8
2014	14.7	15.7	12.9	32.8	30.7	7.3	20.1	20.0	2.5	10.2	9.9	3.7	-1.4	0.3	6.5
2013	14.5	15.2	13.2	32.8	29.8	8.3	19.4	19.2	2.3	9.5	9.3	3.9	-1.6	0.0	5.7
2012	13.4	13.4	11.3	29.6	27.6	6.9	18.0	18.1	1.9	9.8	9.7	2.9	-0.4	0.4	4.4

ETR in percentage, symbols analogical as in Table 2

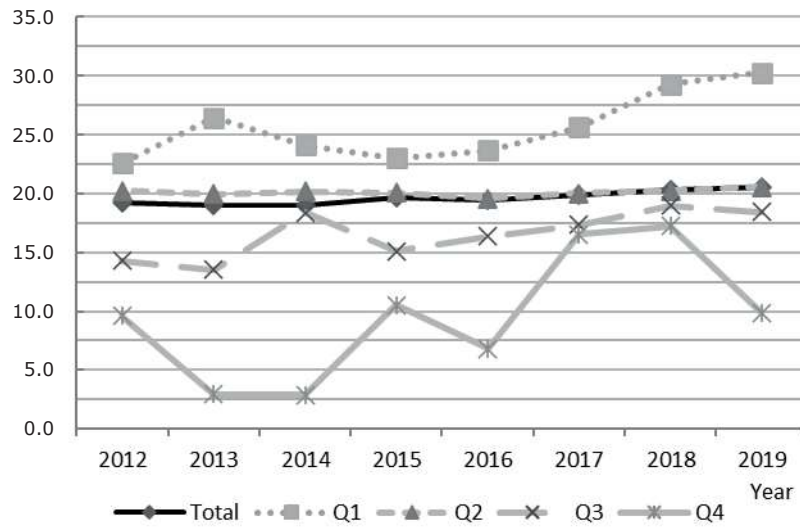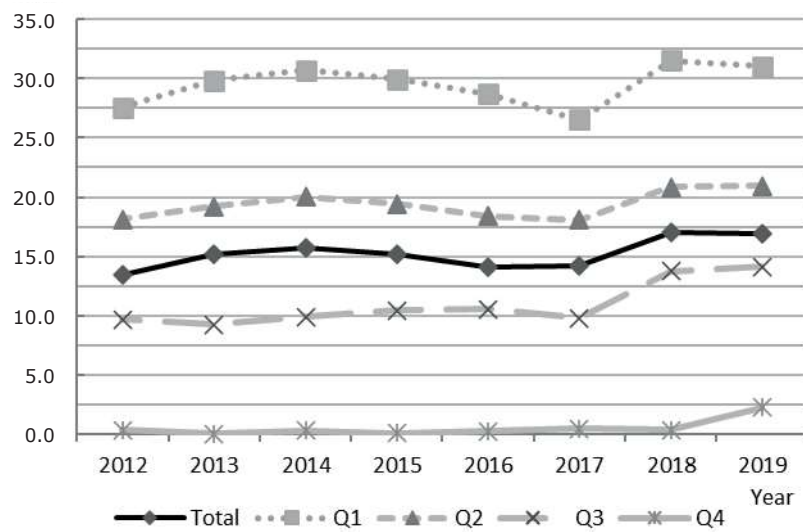**Figure 1.** Effective tax rate – median [%]

Figure 2. Current effective tax rate – median [%]

Table 4

Results of significance test

	Total	Q1	Q2	Q3	Q4
ETR	H = 7.757 p = .0513	H = 4.878 p = .180	H = 6.735 p = .080	H = 6.692 p = .082	H = 2.745 p = .432
2019 vs 2018	1.000	1.000	1.000	1.000	1.000
2019 vs 2017	1.000	1.000	0.643	0.796	1.000
2019 vs 2016	0.145	0.715	0.061*	0.312	1.000
2018 vs 2017	1.000	0.886	1.000	0.597	1.000
2018 vs 2016	0.069*	0.334	1.000	0.217	0.859
CETR	H = 13.116 p = .0044	H = 15.919 p = .0012	H = 72.238 p = .0000	H = 68.425 p = .0000	H = 13.131 p = .0044
2019 vs 2018	1.000	1.000	1.000	1.000	0.667
2019 vs 2017	0.043**	0.011**	0.000**	0.000**	0.031**
2019 vs 2016	0.060*	0.200	0.000**	0.000**	0.005**
2018 vs 2017	0.066*	0.005**	0.000**	0.000**	1.000
2018 vs 2016	0.091*	0.112	0.000**	0.000**	0.502

The table presents the results of the statistical analysis of the significance of differences between the results in the years 2016–2019 for ETR (Panel A) and CETR (Panel B) using the Kruscal-Wallis tests. The value of the H statistic and the p-significant level are presented. The paired comparisons of indicators in individual years were presented using Dunn's post-hoc test and the significance level obtained. Sign * indicate significance of results at the level of $0.05 < p \le 0.1$ and ** at $p < 0.05$.

The highest CETR values were recorded in 2019 and 2018, both in the entire sample and in the companies included in Q1, Q2 and Q3. The highest values in these years were recorded both in relation to the average and the median CETR. The significance analyzes carried out indicate that in the entire sample, the CETR values recorded in 2019 and 2018 are statistically significantly higher than those recorded in 2016–2017 at the level of $p < 0.1$. Thus, the obtained results confirm the thesis that the changes introduced to the tax law resulted in a decrease in the tax efficiency of the surveyed companies.

The scale of this mechanism is not the same. While the increase in CETR is observed in all quartiles, the statistical significance is confirmed especially for companies Q2 and Q3, i.e. half of the surveyed population recording CETR closest to the average. In the group of companies that bear the highest tax burdens (Q1 the highest CETR value), the differences between the CETR values are visible, but the tests confirm their statistical significance only when compared with 2017. Companies with the highest tax efficiency, the lowest CETR, do not show clear trends, probably due to taxation being close to zero in this group and relatively high volatility of results.

The obtained ETR values are characterized by high variability, therefore few conclusions are confirmed with statistical significance. Median ETR for the whole sample observed in years 2019 and 2018 is the highest in the whole analyzed period. Similar relationships were observed for Q1 and Q3. This leads to the conclusion that not only did the current tax liabilities increase, but that tax burdens are also the highest after taking into account deferred tax. This means that businesses are less likely to create deferred tax assets that is, recognizing that certain items of expenses or revenues will be deductible in the future.

It is worth noting that the median CETR for 2018 is higher than 2019 both in the entire sample and in the Q1, Q2, Q3 groups. Similarly, the CETR observed for the entire sample and for the Q1 group is higher in 2018 than in 2019. Although the observed differences between 2019 and 2018 in tax efficiency measures are not statistically confirmed, the improvement in tax efficiency in 2019 compared to 2018 may indicate that enterprises are adapting to the changed law and are gradually taking steps to improve tax efficiency. Subsequent analyzes were aimed at identifying those companies for which the observed decrease in efficiency was the greatest. The analysis gives the variable Z indicating the % decrease in tax efficiency measured with CERT recorded in a given entity in 2018–2019 compared to the one recorded in 2017–2018. The results are presented in Table 5. Research has shown that the hypothesis that changes in tax efficiency in all efficiency groups are the same should be rejected. The average CERT value recorded in the years 2018–2019 in the analyzed sample was 19.4%, and in 2016–2017, i.e. before the changes to the tax law, 17.3%. The introduced changes to the tax law resulted in a decrease in the tax efficiency of companies measured by CETR by an average of 17.7%, the median of 14.8%. The statistical significance of the differences between the 2018–2019 and 2016–2017 effectiveness was confirmed statistically at every significance level. The decrease in efficiency is related to the achieved efficiency. The lower the efficiency (higher CERT), the greater the recorded changes. This relationship was statistically confirmed at $p = 0.04$.

A high variability of the observed changes in effectiveness was observed depending on the characteristics of the companies studied. Among the analyzed features, only in the case of the value of assets should one reject the null hypothesis that companies of different sizes are characterized by the same change in tax efficiency. Large companies with the highest sales, assets and capitalization recorded the greatest decrease in efficiency (increase in CETR). The level of profitability as well as debt seems to be irrelevant to the level of recorded changes in tax efficiency.

The third analyzed thesis has not been confirmed. The conducted research did not allow the rejection of the null hypothesis that the observed changes in tax efficiency are identical in groups distinguished on the basis of the auditor examining the enterprise, belonging to a holding, or conducting capital investments. Companies that had financial statements audited by the big four suffered from

fewer drops in efficiency than others. Therefore, the thesis that companies surveyed by the big four are more likely to use tax planning and are more influenced by the changed regulations is not confirmed. The data suggests, however, that the changes in regulations had a greater impact on capital groups and enterprises involved in capital investments. However, the presented results have not been sufficiently confirmed by the statistical tests and should therefore be treated as preliminary theses for verification in subsequent studies.

Table 5

Change in CETR between 2019–2018 and 2017–2016

Panel A delta CETR 2019–2018 vs 2017–2016			
Change	AVG	MED	StDev
AVG 2019–2018	19.4	17.1	23.6
AVG 2017–2016	17.3	15.7	21.8
Z (delta)	17.7	14.8	53.0

Panel B: feature analysis											
Indica-tors	Q1	Q2	Q3	Q4	K-W	p	Q1 vs Q2	Q1 vs Q3	Q2 vs Q4	Q2 vs Q3	Q3 vs Q4
CETR	30.3	23.5	12.7	-0.6	8.30	0.040**	*	**	*	**	–
Sales	2.8	19.6	22.9	21.3	2.27	0.516	–	–	–	–	–
EBIT	15.1	12.4	5.4	-2.5	5.77	0.122	–	–	–	–	–
Assets	13.5	13.6	7.3	34.2	8.53	0.036**	–	–	*	–	**
ROA	8.3	9.1	12.1	1.2	2.65	0.448	–	–	–	–	–
ROE	14.7	14.8	25.6	15.5	2.5	0.446	–	–	–	–	–
D/E	17.4	12.1	17.3	24.1	0.4	0.929	–	–	–	–	–
Capital-ization	12.3	7.9	11.6	28.7	6.2	0.103	–	–	–	–	–

Group	YES	NO	F	p
Auditor Big4	8.9	28.9	1.184	0.277
Holding	23.0	15.2	0.487	0.486
Invest-ment	22.1	13.4	0.9	0.344

Panel A presents descriptive statistics on the average CETR value in 2018–2019 and 2016–2017. The Z variable represents the percent change in CETR between

these periods. Panel B presents the values of the variable Z for companies with different characteristics. The values Q1, Q2, Q3, Q4 represent companies grouped in the quartiles according to the indicated characteristics such as sales, capitalization, etc. Auditor Big4 refer to companies having audited financial statements by the four largest professional services networks, Holdings companies that form capital groups, Investment companies for which capital activities. Panel B presents the results of tests indicating whether the Z values are statistically different in the analyzed groups. When comparing multiple groups, the values of the H statistic for the Kruskal-Wallis tests and the corresponding confidence level were given. For parameters with statistically significant differences between the groups, the results of the Duun tests for stochastic dominance among multiple pairwise comparisons were presented, * indicate significance of results at the level of $0.05 < p \le 0.1$ and ** at $p < 0.05$.

When comparing two groups, the value of the F statistic and the corresponding confidence level p for the t-test were given.

5. Summary

The conducted research confirms that changes in tax law in Poland since 2017 clearly aimed at tightening the tax system and limiting tax planning practices have affected Polish companies. After a few years increase in tax efficiency indicated in the previous research (Kowalski, 2018), in 2018 and 2019 it started to decrease. Changes in tax law caused a reduction in the tax efficiency of companies. The presented research results may indicate the relationship between changes in tax law and tax efficiency and enterprises and the value of the tax burden incurred. When interpreting the results, the influence of other, not studied factors, cannot be ruled out. However, the observed dependencies may be a source of further research.

Tax efficiency for companies listed on WSE measured by ETR as well as CETR in years 2018 and 2019 was the lowest in the whole analyzed period embracing years 2012–2019. On average, the tax efficiency measured by CERT decreased in the sample in years 2018–2019 by 17,7% (median 14,8%) compared to the one observed in years 2016–2017. The decrease in efficiency is especially noticeable for companies with average tax values included in the second and third quartile of CETR.

Higher CETR values were recorded in 2018, i.e. the first year of the application of the most restrictive regulations. A small but clearly marked decrease in CETR in 2019 may mean that enterprises started to adapt to new legal regulations. Thus, the research preceded the thesis, already proven in the literature, that the change in standards triggers a reaction in the form of tax management (Famulska, 2010).

Similarly median ETR in 2019 (20,5) and 2018 (20,3) was the highest in whole analyzed period 2012–2019. Volatility ETR in the sample was much bigger than

the volatility of CERT and consequently the increase in ETR was not statistically confirmed. However, the data may suggest that changes in the law that observed change in tax efficiency is permanent, and that enterprises do not see the possibility of lowering the tax burden in the future. The propensity of enterprises to create deferred tax assets is decreasing.

At the same time, the results in the field of ETR confirm previous studies indicating a surplus of the effective tax rate over the nominal tax rate, while it should be noted that the surplus is deepening. This may indicate a further complication of the tax settlement system and an increase in the number of titles that cause permanent differences between the tax and balance sheet results (Sztuba, 2016).

The initial results suggest that large companies (classified by the first quartile of revenue, assets and capitalization) have noted the largest decreases in tax efficiency, as well as companies that exist as holding structures and those engaged in capital investment.

Undoubtedly, the preliminary research indicates that the Polish market is an interesting arena in which we can observe the clash between enterprises and authorities on a very intense scale. In this context, studies of this market can provide interesting conclusions for research on taxation, particularly in developing markets. Further research may concern the impact of individual regulations on taxation and help to find an answer to the question of which of the introduced changes to the law contribute to the decline in tax efficiency to the greatest extent. Another important question seems to be which companies have experienced drops in efficiency, as this will make it possible to assess whether the changes to the tax law act are as intended by the legislator or if they have caused a much wider impact not only aiming against multinationals and transfer taxation abroad.

The noted phenomena of changes in tax efficiency may have wide further consequences on the operating results of companies, their propensity to invest and the behavior of markets, including share prices. Although these phenomena have been extensively presented in the literature (Desai, Dharmapala, 2009; Hanlon, Slemrod, 2009; Hanlon, 2015), their observation in the conditions of such intense clash between company and ruler behavior may provide fresh, interesting conclusions.

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Summary

The article presents an analysis of changes in the tax efficiency of companies listed on the Warsaw Stock Exchange. After 2017, some changes to the tax law aimed at tightening the regulations on an unprecedented scale were introduced.

The research conducted showed that since 2018 there has been a decrease in tax efficiency measured with effective tax rate (ETR) and current effective tax rate (CETR). On average, in 2018–2019, the efficiency measured with CETR dropped by 17.7%, the median by 14.8% compared to the previous years. In 2018 and 2019, the value of the CETR was the highest in the entire analyzed period, i.e. from 2012 to 2019. At the same time, the propensity of companies to create deferred tax assets is declining, and the effective tax rate is also growing. The changes mainly concern companies with average tax efficiency, large entities forming capital groups, and companies implementing capital investments. The article presents a discussion on the observed trends and formulates directions for further research.

JEL codes: F38, H2, K34, M4

Keywords: *tax management, tax efficiency, tax policy, tightening tax policy, effective tax rate – ETR, current effective tax rate – CERT, Warsaw Stock Exchange*