ERASMUS UNIVERSITEIT ROTTERDAM

Mandatory audit firm rotation and tax avoidance

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Evidence from the European Union

Master's thesis

Abstract:
This study examine the association between mandatory audit firm rotation for tax avoidance of publicly listed entities in 25 EU member states. Tax avoidance scandals of multinational companies such as the Starbucks case negatively reflects to the trustworthiness of the auditor. To reduce the negative effects of long audit tenure a mandatory audit firm rotation is imposed by the EU, which is effective since 17 June 2016. This mandatory audit firm rotation should increase the audit quality by increasing the independence, integrity, objectivity and professional skepticism of the auditor. Therefore, this study examine the direct effect between mandatory audit firm rotation and tax avoidance. The examination period of this study begins from 2003 and ends in 2019. The sample is analyzed via pooled OLS-regression analysis. This study finds that there is no statistically significant effect of mandatory audit firm rotation on the level of tax avoidance. This suggests that the legislation is ineffective in reducing tax avoidance.

Keywords: *mandatory audit firm rotation, tax avoidance, EU audit reform, voluntary audit firm rotation*

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Introduction

In the first chapter of this study, the research question will be discussed after presentation of the background, motivations, and contributions of this paper to current literature on tax avoidance. Furthermore, the research design and findings of the paper will be discussed. At the end of this chapter, the structure of this thesis will be presented.

1.1 Background

The tax avoidance behavior of companies is a continuous problem, a multinational company can choose which member state it should settle down in to pay as little tax as possible (Hanlon and Heitzman, 2010). They can do this because each member state has its own tax legislation (Duenas & Bunn, 2019). The following EU states in the top 10 European tax havens: England, Germany, Ireland, Netherlands, and Luxembourg. A tax haven is a country which offers advantageous environments to avoid taxes (Parietti, 2019).

The well-known multinational company Starbucks engaged in tax avoidance activities in England. Between 2001 and 2011, Starbucks described its operations in England as profitable to its investors, but reported losses to the tax authorities of England. This was possible because of its royalty payments of 6% of its revenues to another Starbucks entity, the use of transfer pricing and inter-company debt. Effectively Starbucks managed to reduce its tax burden from 24% to less than 5% (Campbell & Helleloid, 2016). Starbucks is used as an illustrative example, but there are similar cases concerning Fiat and Apple.

Tax avoidance is a major problem for governments all over the world because the existence of tax avoidance means missing revenues for the government. They can otherwise use these taxes to finance their expenditures. Infrastructure, the judicial system, the education of the workforce, and the health system in a country are a few examples of the services a government provides for its inhabitants and companies. To finance these services, a government needs income (Slemrod & Yitzhaki, 2002).

A study by Irianto, Sudibyo, and Wafirli (2017), find evidence that firm size positively influences tax avoidance. If big companies engage in tax avoidance, the government of these countries will miss a large amount of income. Therefore, these governments need the means to detect and correct firms that are avoiding taxes. The audit opinion or report of an auditor is an important instrument for the government to check whether the financial statements of companies is free from material misstatements and errors. Additionally, they can be used to detect illegal actions because tax-related items on the balance sheet, or profit and loss statement, are also audited while auditing the financial statements (Slemrod & Yitzhaki, 2002).

In order to provide an unbiased opinion, the auditor must act with the following principles in mind: responsibility, public interest, integrity, objectivity and independence (Mintz & Morris, 2017). If there is a long audit tenure between the audit firm and its client there are several risks that can endanger the objectivity and independence of the auditor (Johnson, Khurana, & Reynolds, 2002). The mandatory audit firm rotation act reduces the period of economic dependence of the client, which leads to auditors being more skeptical and objective during the audit since they know the opinion they provide on the financial statements of their client will not affect their revenues (Carcello & Nagy, 2004). Lee & Kao (2018) find evidence that auditors accept the tax aggressiveness behavior of the client if they have a high relative interest in this particular client.

Additionally, when an auditor does the same audit for a long period, the auditor is inclined to rely on previous audits which may lead to them overlooking material errors and mistakes. Johnson et al.(2002) find evidence in their study that long audit tenures are associated with less professional skepticism from the auditor. Whereby the auditor may overlook the aggressive tax behavior of its client. To mitigate these risks and to ensure the auditor stays independent and objective, the EU audit reform legislation includes the mandatory audit firm rotation law.

For the above reasons, the tenure of the auditor must be limited because a new auditor does the audit with a fresh outlook and therefore pays more attention while doing the audit (Johnson et al., 2002). However, the audit firm rotation is a crude instrument to reduce tax avoidance because an audit firm rotation incurs switching costs and less client-specific knowledge (Carcello & Nagy, 2004).

Given the above arguments, it is not clear whether the benefits of this act outweigh the costs so there should be more research done on if the mandatory audit firm rotation has an effect on tax avoidance.

1.2 Contribution

To date, there has not been any research done about the direct effect of mandatory audit firm rotation on tax avoidance. This is because the law became effective recently and the mandatory audit firm rotation act is only associated with audit quality in prior literature. There are several measurements used to measure audit quality in current literature. For example, accruals are utilized. Accruals are mainly utilized to detect earnings management and this might indicate whether a company is avoiding taxes (Shafai, Amran, & Ganesan, 2018). However, it is only capable of capturing a limited amount of tax avoidance. For example, tax shifting will not be detected by this measurement. Therefore, the audit quality is an insufficient measurement for tax avoidance. This study is one of the few that looks to the direct effect of audit firm rotation on tax avoidance based on the effective tax rate.

This study contributes to the current literature as it combines two different topics of accounting literature, namely audit firm rotation and tax avoidance, which have not been analyzed to date. This thesis extends the mandatory audit firm rotation in tax research. Additionally, this thesis extends the behavior of an auditor towards a firm's perspectives to engage in tax avoidance.

1.3 Research question

Since auditors are held in poor regard due to the international scandals, there has been an increase in regulations directed at improving audit quality, inclusive of audit firm rotation. In this paper, the focus is on the effect of mandatory audit firm rotation on tax avoidance in the EU. The legislation regarding mandatory audit firm rotation is included in Regulation 537/2014 and Directive 2014/56/EU and applies from 17 June 2016. For public interest entities, the audit firm tenure is limited to 10 years (Cameran, Negri, & Pettinicchio, 2015; EY, 2014). This legislation is not imposed to avoid taxes but can influence it by improving the independence and objectivity of the auditor. Due to the exogenously nature of mandatory audit firm rotation, the causality of mandatory audit firm rotation on tax avoidance can be determined. This paper examines whether the mandatory audit firm rotation in the audit practices affects tax avoidance activities in the business realm. Therefore, the research question proposed by this paper is:

Is there an association between mandatory audit firm rotation and the extent to which tax avoidance occurs in EU companies?

1.4 Methodology

In this study, the final sample includes firm-year observations from public listed entities of 25 EU member states from the time period between 2003 and 2019. The data used for this study is extracted from the Compustat Global database, obtained from Wharton Research Data Service (WRDS). The data is analyzed via pooled OLS-regression analysis with robust standard errors. For each of the 25 EU member states, the maximum initial duration is imposed by national law, which is used to determine if the audit firm rotation is mandatory or voluntary. The mandatory audit firm rotation is exogenously determined because this is imposed by law. The mandatory audit firm rotation variable is classified as a post variable. In this thesis, tax avoidance is operationalized via the GAAP effective tax rate and cash effective tax rate.

1.5 Main findings

After conducting the pooled-OLS regression models with robust standard errors, this study finds no statistically significant effect of mandatory audit firm rotation on tax avoidance. This suggests that the legislation is ineffective in reducing tax avoidance. These results hold even when the lagged pooled-OLS regression models are conducted, which I classify as a robustness test of this study. The finding of this study is in line with the findings of Khan and Chen (2017).

1.6 Structure of this thesis

The outline of the paper is as follows. In chapter 2, prior literature related to concepts of audit firm rotation and tax avoidance is discussed. This chapter also includes the legislation regarding mandatory audit firm rotation. In chapter 3, I develop the hypothesis of this study after discussing how auditors may increase and decrease tax avoidance and how this is related to mandatory audit firm rotation. In chapter 4, I present the research methodology, which contains data collection, sample description, regression model and the operationalization of the variables. In chapter 5, I analyze the descriptive statistics and Pearson correlation. In chapter 6, the empirical results are discussed, mainly as to whether this leads to accepting or rejecting the hypothesis. In chapter 7, the results of the robustness test are discussed. Chapter 8 provides the conclusion of this study and answers the research question. Finally in the last chapter, I discuss the limitations of this study and recommendations for further research.

2. Theoretical background

In this chapter, I discuss the mandatory audit firm rotation act. Further, I define what is meant by tax avoidance and discuss the main findings in the literature of tax avoidance and commonly used measurements of tax avoidance. Finally, I discuss findings in the literature of the influences of audit quality on tax avoidance.

2.1Mandatory audit firm rotation

2.1.1 Mandatory audit firm rotation act

In the last decade, auditors have been put in poor regard due to well-known international accounting scandals. Auditors were blamed for not being impartial enough to avoid these scandals. This has led to an increase in regulations directed at improving audit quality, including audit firm rotation. In the academic literature, mandatory audit firm rotation is defined as "periodical breaks to audit engagements to avoid excessively long relationships between the auditor and the client" (Cameran et al., 2015, p. 2).

The legislation regarding mandatory audit firm rotation is included in Regulation 537/2014 and Directive 2014/56/EU and applies from 17 June 2016. For public interest entities, the tenure period of an audit firm should be at least a year and is limited to 10 years (Cameran et al., 2015). Member states can apply a rotation period of less than 10 years according to their respective national law. For example, Belgium has a nine year audit firm rotation period and Poland has a five year audit firm rotation period. In appendix 1, mandatory audit firm rotation legislation, the initial duration of engagement of EU member states is mentioned. For firms which conduct a public tender in accordance with Art. 17 of the Regulation, the initial maximum duration period and the maximum engagement period is extended up to 20 years. For firms with a joint audit, the maximum engagement period is extended up to 24 years (Willekens et al., 2019). There are four transition periods:

1. the public interest entity should switch to another audit firm on or after 17 June 2020 if the audit engagement started before or on 16 June 1994
2. the public interest entity should switch to another audit firm on or after 17 June 2023 if the audit engagement started between 17 June 1994 and 16 June 2003
3. the public interest entity should switch to another audit firm in 2017 if the audit engagement started between 17 June 2003 or 16 June 2006
4. the public interest entity should switch to another audit firm after the maximum audit tenure of 10 years, if the exemptions of a public tender or joint audit do not apply or if the audit engagement had started after 17 June 2006 (KPMG, 2019).

Besides the mandatory audit firm rotation, Regulation 537/2014 and Directive 2014/56/EU states a prohibition of non-audit services while performing the audit (Willekens et al., 2019).

The EU audit reform legislation has been active from June 2014 and it states that all member states are obliged to integrate this rule into their national law within two years the legislation became effective. Most of its member states enacted this requirement within this period except for Croatia, Estonia, Poland, and Slovenia (EY, 2014).

The predecessor of this act is the regulation regarding partner rotation, which is still mandatory. The partner audit tenure should be rotated after the seventh engagement year. The United States does not subscribe to the mandatory audit firm rotation and still only has legislation regarding partner rotation (Cameran et al., 2015).

The long relationship built up by an auditor and their client has led to a decrease in the audit quality because auditors became less independence, less skeptical, and less objective during the audits. The mandatory audit firm rotation act will avoid long relationships forming between these two parties (Jackson, Moldrich, & Roebuck, 2008).

2.1.2 Pros of the mandatory audit firm rotation act

The mandatory audit firm rotation act has been implemented to increase audit quality. By imposing periodic audit firm rotation, the independence of the audit will increase because the act aims to avoid building excessively long relationships between the auditor and its customer which may result in the auditor acting in favor of the client (Cameran et al., 2015). There are two subtypes of independence, independence of mind and independence in appearance. IFAC (2006) defines independence of mind in section 290.8 as ''the state of mind that permits the provision of a conclusion without being affected by influences that impair professional judgment, allowing an individual to act with integrity and exercise professional skepticism and objectivity'' (IFAC, 2006, p. 39). Independence in appearance is defined by IFAC (2006) in section 290.8 as "the avoidance of facts and circumstances that are so significant that a reasonable and informed third party, having knowledge of all relevant information, including safeguards applied, would reasonably conclude a firm's, or a member of the assurance team's integrity, objectivity or professional skepticism had been compromised" (IFAC, 2006, p. 39). Johnson et al. (2002) find evidence in their study that long audit tenures are associated with less independence of the auditor, which leads to less effort to detect material misstatements during the audit.

Another pro of the mandatory audit firm rotation act is that a new auditor does the audit with a fresh outlook and therefore pays more attention while doing the audit. The new auditor maintains a high level of professional skepticism in all areas of the annual report which results in the identification of issues that were overlooked by the auditor before them. When an auditor is conducting the same audit for a long period, the auditor is inclined to rely on previous audits which may lead to them overlooking material errors and mistakes (Cameran et al., 2015).

During the final years of the audit engagement, the auditor will be more critical during the audit of financial statements in order to protect their reputation since they will be aware that an auditor from another audit firm will examine their working practices. Therefore, the auditor will clean up the financial statements before handing it over. This enhances audit quality further (Lennox, Wu, & Zhang, 2014).

The mandatory audit firm rotation act reduces the period of economic dependence on the client, which will lead to fewer incentives for the auditor in supporting the accounting policies of the client (Cameran et al., 2015). Since the revenues earned are not in perpetuity, auditors will be less dependent on their clients, and this will lead to auditors being more skeptical and objective during the audit since they know the opinions given on the financial statements of their client will not affect their revenues (Carcello & Nagy, 2004).

The study of DeAngelo (1981) concludes that the incumbent auditor earns client-specific quasi-rents because of the significant start-up costs. The incumbent auditor has cost advantages over potential competitors because it has company specific knowledge that the new auditor has to acquire. Therefore it can set its audit fees at a lower amount than competitors. To retain the customer, the auditor has incentives to act opportunistically to keep their client satisfied (Cameran et al., 2015).

There is an oligopoly structure in the audit market around the world which causes a lack of competition. The oligopoly structure is dominated by the well-known Big Four audit companies (PwC, EY, Deloitte and KMPG), that have the biggest clients in their portfolios. By imposing periodic audit firm rotation, regulators hope an increase in competition in the audit market and a fairer distribution of clients for the Big Four and Non-Big Four audit firms (Cameran et al., 2015).

2.1.3 Cons of the mandatory audit firm rotation act

Besides the benefits of this regulation, there are also costs for changing the audit firm. These include switching costs, loss of client-specific knowledge, organizational disruptions and the ability of the client to negotiate on audit fees.

Carcello and Nagy (2004) study the effect of the tenure length of an audit firm on fraud in financial reporting in the United States. In their study, they find evidence that a mandatory audit firm rotation shortens the audit firm tenure, which leads to a decrease in the audit quality base because there is less client-specific knowledge. Additionally, from the study conducted by DeAngelo (1981), it was concluded that the incumbent auditor will lose their client-specific quasi-rents when the engagement between the auditor and the client is terminated. On the other hand, the client has switching costs because they have to put time and effort into telling the new auditor about its core business and underlying process (Cameran et al., 2015).

The periodic audit firm rotation will result in a loss of client and industry-specific knowledge because a certain amount of time passes before the auditor becomes familiar with the business process, accounting systems, and internal controls of its client. During this period, the auditor may miss material errors and mistakes, which negatively affects the audit quality (Cameran et al., 2015).

Finally, there is a decrease in information cost for the stakeholders because in a mandatory audit firm rotation setting, they cannot determine easily if the decision to appoint a new audit firm was based on a voluntary or mandatory basis (Cameran et al., 2015).

2.2 Tax avoidance

2.2.1 Definition of tax avoidance

Before the literature review regarding the dependent variable of this study, it is important to explain what is meant by the term tax avoidance in this study. In current literature, the following terms are used for tax behavior to gain an advantage in saving taxes: tax planning, tax aggressiveness, tax management, tax shelter, tax evasion, and noncompliance. Hanlon and Heitzman (2010) define tax avoidance as “the reduction of explicit taxes by tax planning strategies” (Hanlon & Heitzman, 2010, p. 137).

In some literature, a clear distinction is made between tax avoidance and tax evasion. With the term tax evasion, all illegal practices and activities of a taxpayer are meant to prevent or minimize its taxation. While with the term tax avoidance describes the legal practices of a taxpayer to save their taxes. However in practice, it is not always clear when something is legal or illegal. To a certain extent it is subjective and up to interpretation (Hanlon & Heitzman, 2010).

The above-mentioned definition of tax avoidance of Hanlon and Heitzman (2010) is very broad. They state that tax avoidance is a continuum. At one end, perfectly legal forms of tax avoidance such as tax planning exist. At the other end, illegal forms of tax avoidance such as evasion and noncompliance exist. In other words, the level of tax aggressiveness in tax planning strategies determines the difference between tax avoidance and tax evasion. Since the degree of tax aggressiveness is subject to the perspective of individuals, the definition of tax avoidance according to Hanlon and Heitzman is followed in this study (Hanlon & Heitzman, 2010).

2.2.2 Literature of tax avoidance

Gupta and Newberry (1997) examined the relation between firm-level characteristics and tax avoidance by the GAAP effective tax rate. They found a negative relation between effective tax rate and leverage. Rego (2003) examined if transnational corporations are actively engaged in tax planning than other corporations. She measured tax avoidance with the GAAP effective tax rate and found an association between the degree of foreign income and tax avoidance. Additionally, a study by Lisowsky (2010) examined the association between firm characteristics and tax avoidance. They find that that the likelihood of tax sheltering is positively associated with foreign income, litigation losses, profitability, size, and subsidiaries located in tax havens. They also found that tax likelihood of tax sheltering is negatively associated with leverage.

Several studies have examined tax avoidance within an agency framework, assuming that managers using after-tax income will engage in more tax avoidance activities to maximize their compensation (Hanlon & Heitzman, 2010). However, Desai and Dharmapala (2006) conclude that equity-based compensation has a negative effect on tax avoidance.

The study of Thomsen and Watrin (2018) examined tax behavior differences over time between the United States and 12 European member states. They find significant evidence that tax avoidance in these European member states has decreased over time.

In this study, tax avoidance is our dependent variable and therefore the existing literature regarding the consequences of tax avoidance is beyond the scope of this research.

2.2.3 Tax avoidance measurements

In current literature, there are various ways to measure tax avoidance. In this paragraph, the most commonly used measurements will be discussed. The measurements described below capture only non-confirming tax avoidance (Hanlon & Heitzman, 2010).

The first measurement is the GAAP effective tax rate. In this measurement, the total tax expense is divided by the pre-tax accounting income (Hanlon & Heitzman, 2010). The GAAP effective tax rate is the rate that affects accounting earnings. The GAAP effective tax rate will not change if a company uses a tax strategy that defers taxes. Accruals are incorporated within the GAAP effective tax rate (Hanlon & Heitzman, 2010).

The second measurement is the cash effective tax rate. According to Hanlon & Heitzman (2010), the cash effective tax rate is measured by the cash taxes paid divided by the pre-tax accounting income. In comparison with the GAAP effective tax rate, the cash effective tax rate is influenced by a tax strategy that uses defers taxes. In the cash effective tax rate, cash taxes paid may include taxes paid for a different period, which leads to a mismatch since the pre-tax income is for the current period (Hanlon & Heitzman, 2010).

The third effective tax rate measure is called the current effective tax rate. This measures the effective tax rate by dividing the current tax expense with the total pre-tax accounting income (Hanlon & Heitzman, 2010).

Since the GAAP effective tax rate, cash effective tax rate, and the current effective tax rate are subjected to year-to-year variation, the long-run effective tax rate is a better measurement. The long-run effective tax rate is computed by the sum of cash taxes paid over a certain period divided by the sum of the pre-tax income over the same period. Since the long-run effective tax rate is based on a long period, the mismatch of cash taxes paid and pre-tax income is solved. In current literature, the meaning of a negative effective tax rate is difficult to interpret since it is not clear how losses affect tax avoidance and how to use and evaluate tax-loss carry forwards. Therefore, the studies in current literature are mainly based on profitable firms (Dyreng, Hanlon, & Maydew, 2008).

Besides the effective tax rate measurements, the book-tax difference is another commonly used measurement for tax avoidance. The difference between the pre-tax accounting income and taxable income indicates the degree of tax avoidance. The greater the difference between the pre-tax income and taxable income, the higher the probability of tax avoidance. However, the book-tax difference measurement cannot be used to compare the degree of tax avoidance across companies with different levels of importance of accounting income (Hanlon & Heitzman, 2010).

Besides the above-mentioned measurements, there are several more measurements for tax avoidance such as abnormal total book-tax difference, unrecognized tax benefits, tax shelter activity, and marginal tax rate (Hanlon & Heitzman, 2010).

2.3 Influence of audit quality on tax avoidance

Several studies have examined the moderating effect of audit quality. For example, the study of Jihene and Moez (2019) examined the moderating effect of audit quality on CEO compensation and tax avoidance. Their findings suggest that audit quality is effective in protecting stakeholders against self-interested managers. Another study that examines the relation between family ownership and tax avoidance also utilizes audit quality as a moderating effect. The results of this study also indicate that audit quality constrains the positive association between family ownership and tax avoidance (Gaaya, Lakhal, & Lakhal, 2007).

Additionally, some studies examined the direct relation between audit quality on tax avoidance. (Kanagaretnam, Lee, Lim, & Lobo, 2016) examined the association between audit quality and the likelihood of tax aggressiveness. This study finds a negative association between audit quality and the likelihood of tax aggressiveness. The audit quality is proxy by industry-specialized auditors and Big Four auditors. These findings are in line with the results of Kurnia, Pratomo, and Handoko (2019). Lestari and Nedya (2019) also finds evidence that audit size and audit fees are negatively associated with tax avoidance. These findings suggests that audit quality negatively affects tax avoidance.

On the contrary, the study of Lee and Kao (2018) found evidence that industry-specialized auditors use their ability in creating tax strategies in favor of their clients. This was also confirmed by Chun-Yan and Chen (2016). From the perspective of an auditor, it might be expected that an industry-specialized auditor will use their ability to combat tax avoidance. However, from the perspective of a tax advisor, it is expected that the industry-specialized auditor will use their ability to create tax strategies in favor of their client. The industry-specialized auditors can be seen as a proxy for audit quality which positively affects tax avoidance (Chun-Yan & Chen, 2016).

Additionally, Lee and Kao (2018) found that auditors accept the tax aggressive behavior of the client if they have a high relative interest in their client. This shows that if an audit firm is economically dependent on a client, they will accept the tax avoidance behavior of the client. Also, the studies of Sikka and Willmott (2013), and Hampton and Sikka (2005) mentioned that well-known international audit firms create tax avoidance schemes in favor of their clients. These schemes are developed by audit firms since they are operating in a competitive market and are thus pressurized to attract and keep their clients (Hampton & Sikka, 2005). The above findings question the auditors' principles of independence, integrity, and to act for the public interest. This points to the importance of a mandatory audit firm rotation act to constrain tax avoidance.

3. Hypothesis development

In this chapter, the hypothesis will be developed. The hypothesis will be based upon the findings in the current literature. The current findings in literature will be divided into three paragraphs namely auditors increasing tax avoidance, auditors decreasing tax avoidance and the ineffectiveness of mandatory audit firm rotation on tax avoidance.

3.1 Auditors decreasing tax avoidance

According to Mintz and Morris (2017), the main task of an auditor is to provide an opinion on the financial statements of a client with a reasonable degree of certainty. The audited financial statements should give a true and fair view of the financial position of the client and should not contain material misstatements. The tax-related items presented in the financial statements are also audited by the auditor, in case of tax avoidance the auditor might be held responsible for not detecting this (Mintz & Morris, 2017). If the auditor detects a material misstatement for example with tax-related items, he/she will not give an unqualified opinion. As a consequence of not attaining an unqualified opinion, the shareholders will question the board of directors at the next shareholder's meeting and may ask the board to resign. In addition, the tax authority can demand an inspection of the books and give penalties or start a legal proceeding against the company (Riguen & Jarboui, 2020). Therefore the objectivity, independence and professional skepticism are instrumental for the detection and reduction of tax avoidance. To keep the auditor independent, objective and skeptical the consequences of not performing in accordance to the law and professional etiquette must be severe. The study of Kanagaretnam et al. (2016) confirms that the negative association between auditor's quality and tax avoidance is more pronounced when the auditor's litigation risk is higher. Also, the studies of Kurnia et al. (2019), and Lestari and Nedya (2019) show a negative relation between auditor's quality and tax avoidance.

3.2 Auditors increasing tax avoidance

Several studies have found evidence that auditors are positively associated with tax avoidance behavior of their clients. Firstly, Lee and Kao (2018) find evidence that auditors accept the tax aggressive behavior of the client if they have a high relative interest in their client. This shows that if an audit firm is economically dependent on a client, they will accept the tax avoidance behavior of the client. Secondly, they find evidence that industry-specialized auditors create tax avoidance strategies in favor of their clients. Thirdly, Lestari and Nedya (2019) find a significant positive effect between the length of audit tenure and tax avoidance caused by the long relationship between the auditor and their client. These findings which question the independence, integrity, and professional skepticism of auditors point out the importance of a mandatory audit firm rotation act to constrain tax avoidance.

3.3 Ineffectiveness of mandatory audit firm rotation on tax avoidance

Khan and Chen (2017) examined the association between mandatory audit firm rotation and tax avoidance via audit quality. They examined the indirect effect of audit firm rotation on tax avoidance by using modified auditor opinions. In contrast to the above findings, they find evidence that mandatory audit firm rotation does not have an indirect association with tax avoidance. However, they find evidence that voluntary audit firm rotation has a significant indirect effect on tax avoidance and that voluntary audit firm rotation increases the level of tax avoidance. This suggests that the mandatory audit firm rotation has no effect on tax avoidance and is therefore an ineffective instrument for the tax authorities to ensure reliable financial statements.

Brooks and Sun (2020) find evidence that long audit firm tenures combat management's behavior in engaging in tax avoidance, which suggests that mandatory audit firm rotation increasestax avoidance. They use their study as empirical support for not implementing the mandatory audit firm rotation act in the United States. This suggests that a long audit tenure is beneficial for the tax authority to reduce tax avoidance, which is in contrast with the findings of Khan and Chen (2017).

The above-mentioned studies show mixed results for the association between audit firm rotation and tax avoidance. Some studies indicate a negative relation between audit quality and tax avoidance, which suggests that a high level of audit quality constrains the level of tax avoidance. The EU regulators implemented the mandatory audit firm rotation to increase audit quality. However, the study of Jackson et al. (2008) examined the effect of the length of audit tenure on audit quality and their results show that there is neither an increase nor a decrease in audit quality. Also, several findings in the literature which question the independence, integrity, and professional skepticism of the auditor due to the built-up long relationship between auditor and client point out the importance of a mandatory audit firm rotation act to constrain tax avoidance. However, the study of Khan and Chen (2017) concludes that there is no relation between mandatory audit firm rotation and tax avoidance.

Besides the mixed results in the current literature, the mandatory audit firm rotation is exogenously determined since this is imposed by regulators. In the current literature, there is only one paper, the study of Khan and Chen (2017), which looked at mandatory audit firm rotation on tax avoidance when the mandatory audit firm rotation was also exogenous determined. However, this study examined the mediating effect of mandatory audit firm rotation on audit quality. The other studies regarding audit quality and audit tenures on tax avoidance are not exogenous determined.

This leads to the following hypothesis, which is stated non-directional and in null form:

> *H1: Mandatory audit firm rotation is unrelated to the extent in which a company engages in tax avoidance.*

4. Research methodology

In this chapter, I will describe the research design. Firstly, I will describe data collection. Secondly, the sample for the study is presented and I will also expand on how this sample is retrieved. In the following paragraph, the regression model is discussed. In the last paragraph of this chapter, the operationalization of variables is described.

4.1 Data collection

To collect data for this research, a quantitative study is used because you can obtain data from a large group and can generalize the results with this method. The data used for this study is extracted from the Compustat Global database, obtained from the WRDS. However, the Compustat database is mainly focused on U.S. listed companies. In the Compustat Global database, they also provide data for European listed companies which is more trustworthy than the Orbis database. Additionally, the Orbis database provides only data from 2009, which is a small timeframe from which to test the hypothesis of this study. The regulation for mandatory audit firm rotations has been effective from 2016. To determine whether a mandatory rotation must take place, I should have data for at least ten years ago since the regulation prescribes a rotation of the audit firm after an audit engagement of 10 years. The DataStream database does not provide data regarding the auditor, while the Compustat Global database has a variable named auditor which mentions the auditor of a specific (fiscal) year.

The regulation regarding mandatory audit firm rotation applies to public interest entities (Willekens et al., 2019). In this study, only the publicly listed companies of the European stock exchange market are included. I retrieved data from the Compustat Global database between 2003 and 2019 for all EU listed companies. However this database does not provide data for Croatia, Sweden, and the United Kingdom and as mentioned above the other databases are not as trustworthy as WRDS or do not provide the data regarding the auditor. I did not include these countries in the sample.

This study focuses on the period between 2003 and 2019 for several reasons. First, the legislation to rotate audit firms after ten years, which is included in Regulation 537/2014 and Directive 2014/56/EU, has been effective from 17 June 2016 (Willekens et al., 2019). To test the effect of this regulation, it is important to have as long a timeframe as possible after the law has been effective. Second, to determine whether a rotation is mandatory or voluntary, data must be available from up to ten years ago. This time period would be 2006. Third, some of the EU countries implemented local regulations and laws concerning mandatory audit firm rotation before 2016. Therefore, I had to choose a starting point before 2006. For example, the Netherlands implemented the “Wet op het accountantsberoep” (law on the accountancy profession) in 2013 and going at least ten years back would result in a time period of 2003 (EY, 2014).

4.2 Sample

After retrieving data from the Compustat Global database, I have compiled raw data from 25 EU, resulting in the datapoints of 5,001 companies and 58,237 firm-year observations.

Since this study is restricted to non-financial firms in the EU, all the companies that were classified with SIC-Codes 6000-6999, which is how the financial industry is defined, are eliminated from the sample (19 companies with 140 firm-year observations). Following the study of Thomsen and Watrin (2010), all firm years with either a negative pre-tax income or negative taxes are excluded, since negative effective tax rates are difficult to interpret. Also, the effective tax rates that were greater than one are excluded in this study.

After generating the variables of this study, the missing relevant data and the duplicate variables are dropped out of the sample. This results in an output of 26,687 firm-year observations for the dependent variable GAAP effective tax rate and 28,137 firm-year observations for the dependent variable cash effective tax rate in the final sample. In table 1, the sample selection procedure is presented. In table 2, the firm-year observations for the 25 EU member states are presented for the GAAP effective tax rate variable and the percentage of these firm-year observations for each country, which shows that 52.3% of this sample consists of firm-year observations of Germany, France, and Poland. In table 3, the firm-year observations for each industry are presented and the percentage of these observations for each industry. Approximately half of the sample (13,164) consists of manufacturing firm-year observations.

For each of the continuous variables, I plot a normal distribution to check whether the distribution of this variable is approximately normal. In the case of spurious outliers, I make a boxplot to determine if I should winsorize the continuous variables and then winsorized it symmetrically by 1% on both sides. I choose winsorizing the outliers instead of deleting them because by winsorizing the outlier it will be replaced by the maximum and minimum values at the threshold. The presented tables and numbers are formulated after winsorizing the continuous variables in this study. In this study, dummy variables and fixed effects are not checked for outliers since this is not necessary.

Table 1 - Sample Selection

	Firm-year observations for the GAAP effective tax rate	*Firm-year observations for the cash effective tax rate*
Initial sample of public listed firms in the EU (excl. Croatia, Sweden and the United Kingdom)	58,236	58,236
Less		
Firms in the financial industry with SIC-code 6000-6999	(140)	(140)
Firm with duplicate	(792)	(792)
Firms with negative effective tax rates	(11,822)	(7,248)
Firms with missing relevant data	(18,795)	(21,919)
Final sample	26,687	28,137
Number of companies:	4,083	4,053

Table 2: Number of firm-year observations for 25 EU member states

Country code	Number of firm-year observations	Percentage of total
Austria	571	2.14
Belgium	871	3.26
Bulgaria	352	1.32
Cyprus	382	1.43
Czech Republic	122	0.46
Germany	5,023	18.82
Denmark	1,044	3.91
Spain	1,088	4.08
Estonia	144	0.54
Finland	1,141	4.28
France	5,042	18.89
Greece	1,284	4.81
Hungary	123	0.46
Ireland	390	1.46
Italy	1,75	6.56
Lithunania	280	1.05
Luxembourg	286	1.07
Latvia	208	0.78
Malta	113	0.42
Netherlands	1,091	4.09
Poland	3,902	14.62
Portugal	397	1.49
Romania	812	3.04
Slovakia	64	0.24
Slovenia	207	0.78
Total	26,687	100.00%

Table 3: Number of firm-year observations for each industry

Industry	*SIC Codes*	*Number of firm-year observations*	*Percentage of total*
Agriculture, Forestry and Fishing	0001-0999	227	0.85
Mining	1000-1499	474	1.78
Construction	1500-1799	1,081	4.05
Manufacturing	2000-3999	13,164	49.33
Transporation, Communications, Electic, Gas & Sanitary services	4000-4999	3,246	12.16
Wholesale Trade	5000-5199	1,370	5.13
Retail Trade	5200-5999	1,169	4.38
Services	7000-8999	5,761	21.59
Public Administration	9000-9999	195	0.73
Total		26,687	100

4.3 Regression model

To test whether the null stated hypothesis should be accepted or rejected, the research will be based on a pooled OLS regression since the data used can be classified as panel data in this study. To control for omitted variable biases, several control variables are added to the regression models based on existing literature.

I choose to utilize a pooled OLS regression model instead of a difference-in-difference design because by using a difference-in-difference design I get high values, greater than 10, for the variance inflation factor assuming there is multicollinearity. There is multicollinearity when two independent variables are highly correlated with each other.

To estimate if there is an association between mandatory audit firm rotation on tax avoidance, the following pooled OLS regression models are formulated including the control variables and fixed effects:

(1) $$CASH\_ETR_{i,t} = \beta_0 + \boldsymbol{\beta_1}*mandatory_{i,t} + \beta_2*voluntary_{i,t} + \beta_3*size_{i,t} + \beta_4*netoperatingloss_{i,t} + \beta_5*intangible_{i,t} + \beta_6*ppe_{i,t} + \beta_7*bigfour_{i,t} + \beta_8*roa_{i,t} + \beta_9*cashholdings_{i,t} + \beta_{10}*leverage_{i,t} + \beta_{11}*changesales_{i,t} + \beta_{12}*capitalexpenditures_{i,t} + \beta_{13}*sga_{i,t} + \sum\beta_j*sic2_{i,j} + \sum\beta_k*country_{i,k} + \sum\beta_m*year_{i,t,m} + \varepsilon_{i,t}$$

(2) $$GAAP\_ETR_{i,t} = \beta_0 + \boldsymbol{\beta_1}*mandatory_{i,t} + \beta_2*voluntary_{i,t} + \beta_3*size_{i,t} + \beta_4*netoperatingloss_{i,t} + \beta_5*intangible_{i,t} + \beta_6*ppe_{i,t} + \beta_7*bigfour_{i,t} + \beta_8*roa_{i,t} + \beta_9*cashholdings_{i,t} + \beta_{10}*leverage_{i,t} + \beta_{11}*changesales_{i,t} + \beta_{12}*capitalexpenditures_{i,t} + \beta_{13}*sga_{i,t} + \sum\beta_j*sic2_{i,j} + \sum\beta_k*country_{i,k} + \sum\beta_m*year_{i,t,m} + \varepsilon_{i,t}$$

In the above-mentioned regression models, *i* are the firms and *t* is the period of time between 2003 and 2019. The variable of interest in this model is mandatory. For additional explanation of the research design, the predictive validity framework can be found in Appendix 2. The variables used in the above regression models are described in Table 4.

Table 4 - Description of variables	
Variable	*Description*
CASH_ETR	The cash effective tax rate, defined as cash taxes paid divided by pre-tax income minus special items.
GAAP_ETR	The financial accounting effective tax rate, defined as total income tax expense divided by pre-tax income minus special items.
mandatory	Independent dummy variable which gets a 1; if the company mandatorily rotates from audit firm between 2016 and 2019 and 0; otherwise
voluntary	Dummy variable which gets a 1; if the company voluntarily rotates from audit firm between 2003 and 2019 and 0; otherwise
size	Natural logarithm of total assets.
netoperatingloss	Dummy variable which gets a 1; if the company has reported a tax loss carry-forward and 0; otherwise
intangible	Intangible assets divided by total assets.
ppe	The gross property, plant, and equipment divided by total assets.
bigfour	Dummy variable which gets a 1; if the audit firm was Deloitte, EY, KPMG, or PWC. 0; otherwise.
roa	Income divided by total assets.
cashholdings	Cash and cash equivalents divided by total assets.
leverage	Long-term debt and divided by total assets.
changesales	The annual percentage change in net sales.
capitalexpenditures	Capital expenditures divided by gross property, plant, and equipment.
sga	Selling, general and administrative expenses divided by net sales.

4.4 Operationalization of Variables

4.4.1 Independent variable – mandatory audit firm rotation

The variable audit firm rotation can have three different outcomes. These are namely mandatory audit firm rotation, voluntary audit firm rotation, and no audit firm rotation. Mandatory audit firm rotation is the variable of interest in our study. However, voluntary audit firm rotation is also included in the regression model as a control variable.

To examine the effect of mandatory audit firm rotation on tax avoidance, the independent variable "*mandatory*" is approached as a dummy variable. I follow the study of Corbella, Florio, Gotti, and Mastrolia (2015) to measure audit firm rotation. When a firm rotates from an audit firm, it gets the value "1" otherwise "0."

This variable is classified as a post variable, post mandatory. This implies that if there was a mandatory rotation in 2016, then 2016 and all the years after 2016 get the value "1." All other observations will be firm-years with no auditor change.

EU member states have the opportunity to apply a rotation period of less than 10 years according to their national law. For example, Belgium has a nine year audit firm rotation period and Poland has a five year audit firm rotation period (Willekens et al., 2019). In order to determine whether there is mandatory or voluntary rotation, I controlled the mandatory audit tenure for each country by its national law. In appendix 1, the audit tenures of each EU member state are described.

In chapter 2.1, the mandatory audit firm rotation act and the different transition periods of this act are mentioned. Since there was a short period after the regulation become effective, 2016 until 2019, not all the transition periods can be examined since the transition period is either in the future or outside the timeframe of this study. Therefore, this study is only focused on public entities that started an audit engagement between 17 June 2003 and 16 June 2006, and public entities that started an audit engagement after 16th June 2006. The first group of public entities should be switching to another audit firm in 2017 and the second group of public entities should be switching to another audit firm after the maximum audit tenure of 10 years (or the maximum audit tenure set by the national law of the EU member states). For simplicity, the exemptions of a public tender or joint audit are not included in this study.

Due to the exogenously nature of mandatory audit firm rotation, the causality of mandatory audit firm rotation on tax avoidance can be determined.

4.4.2 Dependent variable – tax avoidance:

In prior literature, the effective tax rate is most used for measuring tax avoidance (Hanlon & Heitzman, 2010). This study will also use effective tax rates to measure tax avoidance. Several types of effective tax rates can be used to measure tax avoidance. These are namely: GAAP effective tax rate, cash effective tax rate, and the long-run effective tax rate. In this study, tax avoidance will be measured on an annual basis. Therefore, the GAAP effective tax rate and cash effective tax rate will be used as the dependent variables. Measuring tax avoidance on an annual basis may lead to year-in-year variation but since there is a small window after the application of the regulation regarding the mandatory audit firm rotation, mid-2016 till 2019, the long-run effective tax rate is not applicable in this study (Dyreng et al., 2018) (Hanlon & Heitzman, 2010).

Additionally, the effective tax rate is only focusing on profitable firm-years because negative effective tax rates are difficult to interpret since it is not clear how losses may affect tax avoidance (Hanlon & Heitzman, 2010). As a result, the effective tax rates in this study are bounded between 0 and 1.

There is an inverse relation between the effective tax rate and tax avoidance. A low value of the effective tax rate indicates there is considerable tax avoidance and a high value indicates a low level of tax avoidance (Hanlon & Heitzman, 2010).

The GAAP effective tax rate for firm *i* in year *t* is captured with the following formula:

$$GAAP\ ETR_{i,t} = \frac{Income\ tax\ expense_{it}}{(Pre\text{-}tax\ accounting\ income_{it} - Special\ Items_{it})}$$

The cash effective tax rate for firm *i* in year *t* is captured with the following formula:

$$CASH\ ETR_{i,t} = \frac{Cash\ taxes\ paid_{it}}{(Pre\text{-}tax\ accounting\ income_{it} - Special\ Items_{it})}$$

4.4.3 Control variables

To control for other factors which might have an impact on the association of audit firm rotation on tax avoidance, the following control variables are put in the regression: voluntary, size, net operating loss, intangible assets to total assets (intangible), property, plant and equipment to total assets (ppe), Big Four, return on assets (roa), cash holdings (cashholdings), leverage (leverage), the percentage change in sales (change sales), capital expenditures and selling, and general and administrative expenses to net revenues (sga). These variables are included following the studies of Dyreng et al. (2008); Thomsen and Watrin (2010); Khan and Chen (2017) and Mills, Erickson, and Maydew (1998). In table 4, and mentioned in paragraph 4.2, a description of each variable is given and how I measure each variable. For each control variable, the reason to include it as a control variable in this study is briefly discussed below.

Following the study of Chen and Khan (2017), I include voluntary audit firm rotation as a control variable, since a company may switch audit firms voluntarily. A major difference between mandatory and voluntary rotation is that mandatory rotation is exogenously determined because it is imposed by law, while voluntary rotation is endogenously determined. A company may have different reasons to change an audit firm. For example, they may switch an audit firm to avoid a qualified opinion. This variable is also a dummy variable, which gets the value “1” if a company switches voluntarily from an audit firm and “0” if otherwise. However, the study of Chen and Khan (2017) also includes no audit firm rotation as a dummy variable. I did not add this variable in this study since the values of “0” in the dummy variables of “mandatory” and “voluntary” audit firm rotation indicates no audit firm rotation. Moreover, the effect of no audit firm rotation on tax avoidance is beyond the scope of this research.

Following the study of Chen and Khan (2017), the dummy variable “Big Four” is included as a control variable because this contains information about the audit firm. They find evidence that Big Four audit firms are not associated with tax avoidance behaviour of their clients Chen and Khan (2017).

A study by Irianto et al. (2017), finds evidence that firm size positively influences tax avoidance. This indicates that large companies, usually more profitable companies, avoid more taxes (Irianto et al., 2017). The profitability of a firm can be measured with its return on assets. Therefore, this is also included as a control variable. However, this was not needed in this sample because all the firm-years in which a company made a loss are dropped, since this results in negative effective tax rates which are difficult to interpret. Additionally, the percentage change in sales is also an indicator of firm size (Mills et al., 1998).

The selling, general, and administrative expenses are included as control variables because the total assets and revenues variation across different industries are much higher than the variation of the selling, general, and administrative expenses (Mills & Maydew, 1998).

Following the study of Rego (2003), the net operating loss is included as a control variable because this can be used by companies making an annual profit to offset it against the losses from other years. The net operating loss is a dummy variable that will indicate a tax-loss carryforward with a "1" and otherwise, it will be "0."

I control for intangible assets because Markle and Shackelford (2012) find in their study that German firms use intangibles to avoid taxes more than U.S. multinationals or Australian firms. This study is based on the EU, which includes Germany.

The ratio of properties, plants, and equipment to total assets is also added as a control variable because this indicates how much of the total assets consist of fixed assets. Fixed assets can be used to avoid taxes via depreciation taxes (Mills et al., 1998).

Cash-holdings is an indicator of how capital intensive a company is. A company with high cash-holding can choose to buy or lease assets. If a company buys or replaces an asset, this will be captured by the ratio of capital expenditures divided by the properties, plants, and equipment (Mills et al., 1998). Therefore, capital expenditures are included as a control variable.

Finally, leverage is included as a control variable because financing transactions may offer opportunities to avoid or minimize taxes for companies (Mills et al., 1998).

4.4.4 Fixed effects

Besides the above-mentioned control variables, three fixed effects are included. Firstly, the fixed effect for the country is included because we study different EU states. The regulation regarding mandatory audit firm rotation has differences from country to country. Additionally, regulations regarding taxes are determined on a country specific level and therefore I control for the different EU member states. Secondly, the fixed effect of industry is included. This is based on the two-digit standard industrial classification (SIC) codes. In this study, firms across all industries are included in the sample except the financial industry, which is classified as SIC code 6000-6999. Also, it is easier to perform tax avoidance activities in some industries, which is the reason why I control for industry differences (Mills et al., 1998). Thirdly, the fixed effects of years are included. During the study period, there may have been time-related effects that influenced outcomes. For example, countries may have adjusted tax laws or there was a crisis. For such time-related circumstances, I control for the different years.

5. Descriptive statistics and correlation matrix

In this chapter, I discuss the descriptive statistics and Pearson correlation matrix. In the descriptive statistics the mean, standard deviation, minimum and maximum of the sample are presented. In the correlation matrix, the correlation coefficients of all the variables are presented. I will discuss the key variables in both paragraphs.

5.1 Descriptive statistics

Because the two dependent variables differ in the number of observations, I created separate descriptive statistics for each of these dependent variables (cash effective tax rate and GAAP effective rate). Tables 5a and 5b provide the descriptive statistics of the dependent, independent, and control variables in this study. The following statistical characteristics are mentioned for each variable in tables 5a and 5b: mean, standard deviation, minimum, maximum, and number of observations. In the description below, only Table 5a will be discussed because Table 5b is interpretable by the description below.

As mentioned earlier, the independent variable is a dummy variable. Therefore, the minimum amount is “0” and the maximum amount is “1.” The mandatory variable explains the percentage of mandatory audit change observations in the dataset. This suggests that only 4.3% of the cases are considered as a mandatory audit firm rotation. This is in line with the expectation because there is a very brief timeframe examined after the regulation began to be effective. In line with the mandatory audit firm rotation variable, the voluntary audit firm rotation variable is a percentage of the voluntary audit firm rotations in the dataset, assuming that 10.9% of the data concerns voluntary audit firm rotations. This suggests audit firm rotations are not performed very frequently and firms stay with the same audit firm for a long period.

The dependent variables of GAAP effective cash rate and cash effective tax rate have a mean of M=0.237 and a standard deviation of SD=0.163, and respectively M=0.160 and SD=0.180. The observation that the GAAP effective tax rate is higher than the cash effective tax rate is consistent with prior research, since firms on average have a lower taxable income than their pre-tax income (Dyreng, Hanlon, & Maydew, 2010). Following Thomsen and Watrin (2018), all firm-years with either a negative pre-tax income or negative taxes are excluded since negative effective tax rates are difficult to interpret. Additionally, the effective tax rates greater than “1,” and the missing values of effective tax rates are excluded in this study.

The size of a firm that is in the dataset has a mean of M=5.687 and a standard deviation of SD=2.319. Considering that size is measured as the natural logarithm of total assets, this mean can be reverse calculated to a sum of 295 million dollars. The analysis of this study is mainly based on large public firms; therefore, no conclusions can be made with regard to small, medium, or private firms.

The intangibles have a mean of M=0.137 and a standard deviation of SD=0.144; this suggests that firms in this sample have a relatively low amount of intangibles and therefore have a limited possibility of reducing the effective tax rate.

The properties, plants, and equipment have a mean of M=0.567 and standard deviation of SD=0.458. This indicated that the average firm in this dataset has 56.7% of fixed assets.

The control variable Big Four indicates that 52.5% of the firm-year observations are audited by Big Four companies. This indicate there is a relatively fair distribution of Big Four and Non-Big Four audit firms in this sample.

The cash holdings have a mean of M=0.134 and a standard deviation of SD=0.145, which suggests companies have a relatively low amount of cash on hand.

The leverage has a mean of M=0.224 and a standard deviation of SD=0.188. This indicates that there is a low amount of borrowed money in the company and therefore there is a limited risk of financial distress.

The capital expenditures have a mean of M=0.127 and a standard deviation of SD=0.238. All the industries in the dataset renew their assets for 12.7% per year, indicating that the industries in this dataset are relatively slow-moving on average.

Table 5a - Descriptive statistics

Variables	*Mean*	*S.D.*	*Min*	*Max*	*Observations*
GAAP_ETR	0.237	0.163	0.000	0.829	26,687
mandatory	0.043	0.203	0.000	1.000	26,687
voluntary	0.109	0.312	0.000	1.000	26,687
size	5.687	2.319	-0.307	1.152	26,687
netoperatingloss	0.762	0.426	0.000	1.000	26,687
intangible	0.137	0.144	0.000	0.726	26,687
ppe	0.567	0.458	0.000	2.144	26,687
Big Four	0.525	0.499	0.000	1.000	26,687
roa	0.017	0.158	-1.164	0.367	26,687
cashholdings	0.134	0.145	0.000	0.841	26,687
leverage	0.224	0.188	0.000	1.061	26,687
changesales	0.094	0.431	-0.980	4.087	26,687
capital expenditures	0.127	0.238	0.000	2.152	26,687
sga	0.284	0.543	0.000	5.169	26,687

Table 5b - Descriptive statistics

Variables	*Mean*	*S.D.*	*Min*	*Max*	*Observations*
GAAP_ETR	0.160	0.180	0.000	0.755	28,137
mandatory	0.043	0.204	0.000	1.000	28,137
voluntary	0.107	0.309	0.000	1.000	28,137
size	5.548	2.355	-0.307	1.152	28,137
netoperatingloss	0.741	0.438	0.000	1.000	28,137
intangible	0.137	0.145	0.000	0.726	28,137
ppe	0.561	0.462	0.000	2.144	28,137
Big Four	0.505	0.500	0.000	1.000	28,137
roa	0.011	0.171	-1.164	0.367	28,137
cashholdings	0.134	0.146	0.000	0.841	28,137
leverage	0.226	0.193	0.000	1.061	28,137
changesales	0.101	0.460	-0.980	4.087	28,137
capital expenditures	0.133	0.256	0.000	2.152	28,137
sga	0.293	0.560	0.000	5.169	28,137

5.2 Pearson correlation

Before performing the regression models, the correlation between the variables is investigated by a Pearson correlation. Table 4 provides the correlation matrix between the variables.

In the model, correlation coefficients over a value of 0.7 indicate multicollinearity. As the table demonstrates, there are no correlation coefficients over the value of 0.7, which indicates there exists no multicollinearity between the variables in the model. Additionally, I checked for multicollinearity with the variance inflation factor (VIF). If the VIF illustrates a coefficient greater than a value of 10, this indicates multicollinearity that must be solved. For all the variables in this study, the VIF was between 1 and 1.9, which indicates that there is very limited multicollinearity and that it is in an acceptable range.

There is a positive significant correlation between the mandatory audit firm rotation and the cash effective tax rate (r=0.015, p=0.024). This suggests that there may be an association between mandatory audit firm rotation and tax avoidance, which indicates that mandatory audit firm rotation could decrease tax avoidance. However, there is a significant negative relation between mandatory audit firm rotation and the GAAP effective tax rate (r=-0.013, p=0.045), which suggests that the tax avoidance measured by the GAAP effective tax rate increases in cases of mandatory audit firm rotation. The GAAP effective tax rate measures tax avoidance against the tax expense of the current book year, while the cash effective tax rate measures tax avoidance against the taxes paid in the current book year but this may include payment of taxes of other years. Therefore, there is a timing difference between these two measurements.

The voluntary audit firm rotation has a significant correlation with GAAP effective tax rate (r=0.014, p=0.025). This is rejected when the correlation between voluntary audit firm rotation and cash effective tax rates is analyzed (r=0.010, p=0.119). The positive significant correlation might indicate that a new auditor will look at the financial statements more objectively, which is in line with the findings of Johnson, Khurana, and Reynolds (2002)

In line with the expectation, the Big Four variable has a positive significant correlation between the cash effective tax rate (r=0.230, p<0.001) and GAAP effective tax rate (r=0.050, p<0.001), which indicates companies audited by a Big Four audit firm are less likely to engage in tax avoidance activities. This is in line with the findings of Chen and Khan (2017).

The return on assets has a remarkably strong correlation with the effective tax rate. There was a positive significant correlation with the GAAP effective tax rate (r=0.209, p<0.001) and cash effective tax rate (r=0.200, p<0.001). This suggests that an increase in profit leads to a decrease in avoiding taxes. The correlation coefficients of the other control variables are consistent with the expectations.

In this study, the significant correlation coefficient between the two dependent variables is strongly significant, suggesting that they measure the same concept (r=0.388, p<0.001).

Table 4: Pearson correlation

	CASH_ETR	GAAP_ETR	mandatory	voluntary	size	net operating loss	intangible	ppe	big4	roa	cash holdings	leverage	change sales	capital expenditures	sga
CASH_ETR	1.000														
GAAP_ETR	0.388***	1.000													
mandatory	0.015*	-0.013**	1.000												
voluntary	0.010	0.014*	0.049***	1.000											
size	0.358***	0.155***	0.055***	0.035***	1.000										
net operating loss	0.291***	0.224***	0.026***	0.017**	0.418***	1.000									
intangible	0.097***	0.039***	0.024***	0.007	0.289***	0.109***	1.000								
ppe	-0.003	-0.045***	0.023***	0.014**	0.109***	0.021**	0.182***	1.000							
big4	0.230***	0.050***	0.064***	0.025***	0.452***	0.171***	0.153***	0.104***	1.000						
roa	0.200***	0.209***	0.019**	0.009	0.269***	0.248***	-0.085***	0.025***	0.126***	1.000					
cash holdings	-0.071***	-0.048***	-0.020**	-0.014**	-0.192***	-0.168***	-0.220***	-0.288***	-0.022**	-0.024***	1.000				
leverage	0.035***	0.011*	0.011*	0.019**	0.172***	0.077***	0.803***	0.188***	0.059***	-0.199***	-0.323***	1.000			
change sales	-0.065***	-0.022**	-0.009	-0.009	-0.034***	-0.024***	0.007	-0.097***	-0.030***	0.045***	0.073***	-0.020**	1.000		
capital expenditures	-0.064***	-0.015**	-0.029***	0.013**	-0.119***	-0.066***	-0.054***	-0.273***	-0.080***	-0.010	0.106***	-0.065***	0.095***	1.000	
sga	-0.143***	-0.170***	-0.013**	-0.024***	-0.204***	-0.184***	-0.030***	-0.086***	-0.085***	-0.394***	0.183***	-0.003	-0.019**	0.046***	1.000

6. Empirical results and analysis

After discussing the descriptive statistics and the Pearson correlation, the regression models are conducted. In chapter 6, the results of the two regression models are discussed and the stated hypothesis will be accepted or rejected based on the results.

6.1 Hypothesis 1

Hypothesis 1, formulated in Chapter 3, expects that the mandatory audit firm rotation is unrelated to the extent in which a company engages in tax avoidance activities. In Table 6, Model 1, the mandatory audit firm rotation has a negative and not significant effect on the cash effective tax rate (B=-0.002, p=0.716). In Table 6, Model 2, the mandatory audit firm rotation has a positive and not significant effect on GAAP effective tax rates (B=0.007, p=0.115). These non-significant findings indicate that there is not an association between mandatory audit firm rotation and tax avoidance. This leads to the acceptance of the hypothesis for both tax avoidance measures.

In Table 6, Model 1, the Big Four dummy variable has a positive significant relation with the cash effective tax rates (B=0.025, p<0.01). This is in line with the findings of Chen and Khan (2017) who also conclude that companies audited by Big Four audit firms are less likely to engage in tax avoidance. However, in Table 6, Model 2, this variable has a negative and non-significant relation with the GAAP effective tax rates (B=-0.001, p=0.796). In contrast with the correlation analysis, the Big Four variable has no significant effect on GAAP effective tax rate in the regression model.

In Table 6, Model 1, the voluntary audit firm rotation has a negative non-significant effect on the cash effective tax rate (B=-0.002, p=0.481). In Table 6, Model 2, this variable also has a negative non-significant effect on GAAP ETR (B=-0.000, p=0.9140). The findings in both models are in contrast with the findings of Chen and Khan (2017), since they find strong evidence that voluntary audit firm rotations increase tax avoidance via modified auditor opinions. The findings of this study illustrate that there is no direct association between voluntary audit firm rotation and tax avoidance.

In Table 6, Model 1, the return on assets has a positive significant effect on the cash effective tax rates (B=0.079, p<0.001). In Table 6, Model 2, the return on assets also has a positive effect on the GAAP effective tax rates (B=0.146, p<0.001). These findings confirm the findings of the correlation analysis and suggest that there is a strong effect between the profitability of a firm and the degree of tax avoidance of a company. More profit leads to less tax avoidance for these firms. This is in contrast with the findings of Irianto et al. (2017) and Mills et al. (1998).

In Table 6, Model 1, the cash holdings have a negative significant effect on the cash effective tax rate (B=-0.025, p<0.001). This is in line with the results in Model 2 for the GAAP effective tax rate (B=-0.041, p<0.001). Both models find evidence that cash holdings increase tax avoidance. This is in line with the findings of Stanfield (2011).

Table 6, Model 1 demonstrates an R-squared of R^2=0.227, which means that 22.7% of the variation in effective tax rate is explained by the independent variable in this model. Table 6, Model 2 shows an R-squared of R^2=0.160. To be able to compare these two models, I used the adjusted R-squared since the number of observations differs between these two models. The adjusted R-squared for Model 1 is R^2adj=0.224 and is R^2adj=0.157 for Model 2. This means that there is approximately 77.6% of unexplained variance in the cash effective tax rate variable and approximately 84.3% of unexplained variance in the GAAP effective tax rate variable.

To test for heteroskedasticity in the regression models, I performed a Breusch-Pagan test. This test checks if there is a constant variance in the error term. This test illustrates that there is no constant variance in the error term and thus I use the robust standard error to solve this.

The residuals of the regression are acceptably normally distributed but demonstrate a homoscedastic but biased result. Therefore, conclusions based on this result must be taken with care. This has been checked with predicted values and residual plots.

Table 6: Pooled OLS regression results

	-1	*-2*
VARIABLES	*CASH ETR*	*GAAP ETR*
mandatory	-0,002	0,007
	(0,005)	(0,005)
voluntary	-0,002	-0,000
	(0,003)	(0,003)
size	0,021***	0,001**
	(0,001)	(0,001)
net operting loss	0,055***	0,053***
	(0,003)	(0,003)
intangible	0,046***	0,035***
	(0,011)	(0,013)
ppe	-0,010***	-0,006**
	(0,003)	(0,003)
bigfour	0,025***	-0,001
	(0,003)	(0,002)
roa	0,079***	0,146***
	(0,005)	(0,006)
cashholdings	-0,025***	-0,041***
	(0,007)	(0,007)
leverage	-0,057***	-0,028***
	(0,008)	(0,010)
changesales	-0,016***	-0,005**
	(0,002)	(0,002)
capital expenditures	-0,015***	-0,007
	(0,003)	(0,005)
sga	-0,004***	-0,017***
	(0,001)	(0,002)
constant	-0,061**	0,110**
	(0,031)	(0,051)
Fixed effects		
Industry	Yes	Yes
Year	Yes	Yes
Country	Yes	Yes
Obervations	28,137	26,687
Companies	4,053	4,038
R-squared	0,227	0,160
Adjusted R-squared	0,224	0,157

*Robust standard errors in parentheses. *** p < 0.01; ** p < 0.05; * p < 0.1*

7. Robustness test

A robustness test is performed to ensure that the outcomes are valid. A robustness test is a test to ensure that the outcomes of a certain test are still valid even when given a change.

7.1 Lagged pooled OLS-regression

A robustness test is performed to ensure that the outcomes of the pooled OLS-regression are valid. For the robustness test, I use the lagged pooled OLS-regression for the earlier regression models. I lagged the independent variable and control variables in the lagged pooled OLS-regression models. By lagging these variables, the dependent variable cannot be influenced since they are from the previous year. However, the independent variable and control variables still affect the dependent variable. By performing the lagged pooled OLS-regression, there cannot be reversed causality and/or simultaneity take place between the variables due to the separation of time there is a blockage. As a result, the risk of reversed causality and/or simultaneity can be put into perspective. Reversed causality and simultaneity are endogeneity concerns, which should be analyzed in an OLS-regression model.

In Table 7, the results of the lagged pooled OLS-regression models are presented. If the number of observations is compared to these two lagged models with the models in Table 6, there is a decrease in the number of observations due to the lagging of the independent variable and control variables that the first-year observations of each firm misses.

To compare the models presented in Table 7 with the models in Table 6, the adjusted R-squared is used since the number of observations differs. The adjusted R-squared of Model 1 in Table 7 is R^2adj=0.226, while the adjusted R-squared of Model 1 in Table 6 is R^2adj=0.224. There is an increase of 0.002 in the adjusted R-squared of the lagged model if approximately 77.4% of the variation in the cash effective tax rate is explained by the independent variable in this model. The adjusted R-squared of Model 2 in Table 7 is R^2adj=0.149, while the adjusted R-squared of Model 2, Table 6 is R^2adj=0.160. There is a reduction of 0.011 in the adjusted R-squared of the lagged model, which means there is approximately 85.1% of unexplained variance in the GAAP effective tax rate variables.

In Table 7, Model 1, the mandatory audit firm rotation has a negative non-significant effect on the lagged cash effective tax rate (B=-0.006, p=0.331). While in Table 7, Model 2, the mandatory audit firm rotation has a positive non-significant effect on the lagged GAAP effective tax rate (B=0.003, p=0.648). This still leads to the acceptance of hypothesis 1 for both tax avoidance measures since the mandatory audit firm rotation coefficients of both models in Table 7 are non-significant.

In Table 7, Model 1, the voluntary audit firm rotation has a positive non-significant effect on the lagged cash effective tax rate (B=0.004, p=0.314), and in Table 7, Model 2, this variable also has a positive but non-significant effect on the lagged GAAP effective tax rate (B=0.002, p=0.615). The coefficients become positive in the lagged pooled OLS regression models, while they are negative in the pooled OLS regression models of Table 6, all the coefficients are still non-significant. This leads to the conclusion that voluntary audit firm rotation has no association with tax avoidance, which is in contrast with the findings of Chen and Khan (2017).

In Table 7, Model 1, the Big Four dummy variable still has a positive significant relation with the cash effective tax rate (B=0.022, p<0.001) and a positive non-significant relation with the GAAP effective tax rate (B=0.001, p=0.586). The positive significant relation with cash effective tax rate is in line with the findings of Chen and Khan (2017), who also conclude that Big Four audit firms do not become a part of the tax avoidance strategies of their clients.

The outcomes of the lagged pooled OLS-regression models of the other control variables are comparable to the previous model mentioned in Table 6, so this model confirms the outcomes of the pooled OLS-regression models.

Table 7: Lagged pooled OLS regression results

	-3	*-4*
VARIABLES	*Cash ETR lagged*	*GAAP ETR lagged*
mandatory	-0,006	0,003
	(0,006)	(0,006)
voluntary	0,004	0,002
	(0,004)	(0,003)
size	0,021***	0,002***
	(0,001)	(0,001)
net operting loss	0,055***	0,045***
	(0,003)	(0,003)
intangible	0,037***	0,027*
	(0,012)	(0,014)
ppe	-0,011***	-0,005*
	(0,003)	(0,003)
bigfour	0,022***	0,001
	(0,003)	(0,002)
Roa	0,107***	0,137***
	(0,006)	(0,007)
cashholdings	-0,009	-0,038***
	(0,007)	(0,008)
leverage	-0,060***	-0,018*
	(0,009)	(0,011)
changesales	-0,007***	-0,008***
	(0,002)	(0,002)
capital expenditures	-0,018***	-0,010**
	(0,003)	(0,005)
Sga	-0,002*	-0,017***
	(0,001)	(0,002)
Constant	0,027	0,131**
	(0,037)	(0,054)
Fixed effects		
Industry	Yes	Yes
Year	Yes	Yes
Country	Yes	Yes
Observations	24,853	23,661
Companies	3,802	3,789
R-squared	0,229	0,149
Adjusted R-squared	0,226	0,145

*Robust standard errors in parentheses. *** p < 0.01; ** p < 0.05; * p < 0.1*

8. Conclusions

This study examines if there is a relation between mandatory audit firm rotation and tax avoidance in EU member states. The audit-related scandals of the past have made clear that the independence, objectivity, and professional skepticism of the auditor is debatable. The EU audit reform legislation was introduced to reduce fraudulent financial reporting and to improve audit quality. An important part of this legislation concerns the mandatory audit firm rotation, which has aims to improve audit quality (Willekens et al., 2019). In addition, mandatory audit firm rotation can reduce the negative effects of tax avoidance by international companies.

This thesis extends the mandatory audit firm rotation in tax research. Additionally, this thesis extends the behavior of an auditor towards a firm's perspectives to engage in tax avoidance. This is one of the few studies that examines the effect of mandatory audit firm rotation on tax avoidance. This is understandable since the regulation regarding mandatory audit firm rotation only just became effective in 2016. There are several studies that have been conducted for the effect of mandatory audit firm rotation on audit quality but they do not look at tax-related items in the annual report and they are therefore not a good measurements of tax avoidance. Therefore, one important stakeholder is overlooked, namely the tax authority. Tax avoidance is a major problem for governments all over the world because the existence of tax avoidance results in missing revenues for the government that they can otherwise use to finance their expenditures. The audit opinion and report of an auditor is an important instrument for the authorities to check whether financial statements of companies are free from material misstatements and errors and to detect illegal actions. During the audit of financial statements, the tax-related items on the balance sheet or profit and loss statement are also audited (Slemrod & Yitzhaki, 2002).

This study created a database of 28,137 firm-year observations for the cash effective tax rate and 26,687 firm-year observations for the GAAP effective tax rate between 2003 and 2019. The data is analyzed via pooled OLS-regression analysis with robust standard errors. This study finds that there is no statistically significant effect of mandatory audit firm rotation on the level of tax avoidance, which leads to the acceptance of hypothesis 1. The hypothesis states that mandatory audit firm rotation is unrelated to the extent in which a company engages in tax avoidance. This suggests that the legislation is ineffective in reducing tax avoidance. These results hold even when this study controls for the well-known control variables such as size; net operating loss; intangible assets; properties, plants, and equipment; Big Four; return on assets; cash holdings; leverage; the percentage change in sales; capital expenditures; and selling, general, and administrative expenses.

To test whether the findings hold after a given change, I performed a lagged pooled OLS-regression analysis with robust standard errors. The findings of the lagged pooled OLS-regression models also indicate that there is no statistical significant effect between mandatory audit firm rotation and tax avoidance, which leads to the answer to the research question: there is no association between mandatory audit firm rotation and the extent of tax avoidance in EU companies.

9. Limitations and recommendations

One of the limitations that this study encounters is the high variation of the effective tax rate. This variation could be caused by the changing profit from year-to-year but could also be caused by deferred taxes. Therefore, the effective tax rate only provides a limited view on the tax behavior of a company. A more appropriate measurement could be the long-run effective tax rate because by taking data from a period of several years, the deferred taxes and year-to-year changes in the profit are averaged out (Dyreng et al., 2008). This study is not able to use the long-run effective tax rate because the mandatory audit firm rotation act only became effective in 2016 so there was insufficient time to measure a long-run effect.

The second limitation of this study is that the effective tax rate measurement is only applicable to firm-years in which a company makes a profit. The effective tax rate cannot be interpreted if this is negative or higher than "1" (Thomsen & Watrin, 2010). Therefore, the effective tax rate measurement only has a very limited view on the theoretical concept of tax avoidance because companies which use deferred taxes cannot be measured via this measurement. To improve the measurement of the effective tax rate, this study should be performed firstly on the national level, and then for every year the average corporate tax rate should be determined and should then be compared with the effective tax rate of a company in the same year. If the effective tax rate is lower than the average corporate tax rate, this is an indication of tax avoidance (Nicodème, 2006).

The third limitation of this study is that it examines only two of the four transition periods of the mandatory audit firm rotatation act. In chapter 2.1, the different transition periods are mentioned. Since there was a short period after the regulation become effective, 2016 until 2019, not all the transition periods can be examined since the transition period is either in the future or outside the timeframe of this study. Therefore, this study is only focused on public entities that started an audit engagement between 17 June 2003 and 16 June 2006, and public entities that started an audit engagement after 16th June 2006. The first group of public entities should be switching to another audit firm in 2017 and the second group of public entities should be switching to another audit firm after the maximum audit tenure of 10 years (or the maximum audit tenure set by the national law of the EU member states).

A fourth limitation of this study is that it only focuses on the initial duration of the audit engagement and does not include the exemptions for a joint audit and a public tender. This cannot be analyzed yet since the maximum duration of these exemptions extends into the future.

This study excludes approximately 50% of the original dataset due to missing values, extreme values, and due to the limitations of the effective tax rate formula. This introduces a considerable selection bias because only companies that made a profit are included in this study. With all these exclusions, the results of this study are limited to a small group of companies that make a profit. Therefore, the results of this study should be interpreted with caution.

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11. Appendix

Appendix 1 – Mandatory audit firm rotation legislation

Table 1: Mandatory audit firm rotation rule of each Member State

EU Member states	*Standard tenure years*
Austria	10
Belgium	9
Bulgaria	7
Croatia	10
Cyprus	10
Czech Republic	10
Denmark	10
Estonia	10
Finland	10
France	10
Germany	10
Greece	10
Hungary	10
Ireland	10
Italy	9
Malta	10
Latvia	10
Lithuania	10
Luxembourg	10
Netherlands	10
Poland	5
Portugal	8 or 9
Romania	10
Slovakia	10
Slovenia	10
Spain	10
Sweden	10
United Kingdom	10

This table presents the initial duration of engagement for Each member state of the mandatory audit firm rotation rule (Accountancy Europe, 2020)

Appendix 2 – Predictive validity framework (Libby boxes)