Firm performance and tax avoidance

Name: L.E. Zevenbergen

Student number: 358441

Supervisor: dr. J. Pierk

MSc Accounting, Auditing and Control

Erasmus University Rotterdam

19 February 2018

Preface

This thesis is about the relation between firm performance and tax avoidance. The study is the final assignment of my master Accounting, Auditing and Control, specialization Accounting and Auditing at the Erasmus University Rotterdam.

Last years I have studied with pleasure all the accounting courses. Besides my interest for accounting I studied also tax courses. To combine both interests I have chosen for the subject firm performance and tax avoidance. Also it is an actual and important issue nowadays.

I thank my supervisor dr. Jochen Pierk for the support by writing the thesis. You have answered my questions and have brought ideas so that I can finished my thesis. Next I thanks my parents, sister and brother for the support during my whole study and this writing process.

Enjoy reading!

Leonie Zevenbergen

Sliedrecht, the 31th of January 2018

Abstract

The relation between firm performance and tax avoidance for firms in European countries has contradictory results in the literature (e.g. Armstrong et al., 2012; Cao and Cui, 2017). The relation has two possible underlying theories; the political cost theory and the political power theory. The political cost theory suggests that better firm performance leads to lower tax avoidance. This theory predicts a negative relation between firm performance and tax avoidance (e.g. Watts and Zimmerman, 1986). The political power theory suggests that better firm performance leads to more tax avoidance because of the availability of resources to hire tax experts etc. (e.g. Siegfried, 1972). This theory predicts a positive relation between firm performance and tax avoidance. I use data from firms of all the member states of the European Union to study the relation. Firm performance is measured as return on assets and tax avoidance as GAAP effective tax rate. The sample is divided in four equal subsamples to get more insight in the relation. The results show that the relation between firm performance and tax avoidance is positive and significant. But the relation is more pronounced if firm performance is low. The results support the political power theory.

Keywords: firm performance; tax avoidance; political power theory; political cost theory.

List of contents

1. Introduction 6
1.1 Background and research question 6
1.2 Motivation 6
1.3 Methodology 7
1.4 Contribution 8
1.5 Structure 8
2. Related literature 10
2.1 Tax avoidance research 10
2.2 Determinants effective tax rates 10
2.3 Measuring tax avoidance 11
2.4 European Union countries 11
2.5 Input for the literature 12
3. Theory and hypothesis 17
3.1 Political cost theory 17
3.2 Political power theory 18
3.3 Hypothesis 18
4. Research design 20
4.1 Regression model 20
4.2 GAAP effective tax rate 20
4.3 Firm performance 21
4.4 Control variables 21
4.5 Sample selection 22
4.6 Descriptive statistics and correlation matrix 23
5. Results 26
5.1 Results entire sample 26

5.2 Results subsamples 27
5.3 Quadratic relation 28
6. Robustness checks 31
6.1 EA-19 and EU-15 countries 31
6.2 Loss in previous years 33
6.3 Split subsamples 34
7. Conclusion 38
References 40
Appendix A Predictive Validity Framework 44
Appendix B Tables 45

1. Introduction

1.1 Background and research question

Tax avoidance is an actual and international issue nowadays. Different tax rates and tax systems create possibilities for tax avoidance (e.g. Kari, 2015). Several factors influence tax avoidance according to research (e.g. Hanlon and Heitzman, 2010; Lee and Swenson, 2012; Delgado et al., 2014). The factor firm performance has different results both positive and negative (see table 1). This thesis studies the relation between firm performance and tax avoidance. I examine why the results of prior studies are not conclusive, by accounting for the potential non-linearity of the relation between firm performance and tax avoidance. The research question of this study is: Does firm performance influence tax avoidance? Two theories exist which give a possible explanation of the association, the political cost theory and the political power theory. The political cost theory suggests that better firm performance leads to lower tax avoidance (Watts and Zimmerman, 1986). This theory predicts a negative relation between firm performance and tax avoidance. The political power theory suggests that better firm performance leads to more tax avoidance because of the availability of resources, to hire tax experts etc. (e.g. Siegfried, 1972; Guha, 2007; Belz et al., 2016). This theory predicts a positive relation between firm performance and tax avoidance. The question is which theory supports the association. Also the question is whether the relation between firm performance and tax avoidance differs for different levels of firm performance and levels of firm performance give reason for the existence of two theories. I examine the possible association by using data from firms with headquarter in the European Union.

1.2 Motivation

My research contributes to the literature of the determinants of the effective tax rate (ETR). I study whether the relation between firm performance and tax avoidance differs for different levels of firm performance to examine why the prior studies are not conclusive. If the relation differs for different levels of firm performance, further research can take into account different levels. Results from prior research can be seen in another light. Beside research methods to the determinants of the ETR have to studied and improved to bring research results, policy and knowledge of tax avoidance to a higher level.

Little research on tax avoidance was conducted in the European Union (Delgado et al., 2014). I use recent data of firms from the European Union to study an underexposed region. Also the prior studies on tax avoidance in European Union do not give conclusive results of the

association between firm performance and tax avoidance (see table 1). Delgado et al. (2014) studies the relation between six determinants, size, leverage, capital intensity, inventory intensity, profitability and the statutory corporate tax rate, and the effective tax rate for firms in 15 European Union member states. Delgado et al. (2014) uses a quantile regression to study different levels of the dependent variable, the ETR. The study finds some nonlinear relations between the six determinants and the ETR. The determinants change by different levels of the ETR (Delgado et al., 2014). The difference with my thesis is that I use another approach. I use a quartile approach for an independent variable, in this case firm performance measured by return on assets, to focus on one explanatory factor. Checking the possible non-linear relation between firm performance and tax avoidance with the method of Lind and Mehlum (2010) is another difference. To the best of my knowledge, there are not studies on the determinants of ETR which use the method of Lind and Mehlum (2010).

1.3 Methodology

I use the database Orbis of Bureau van Dijk to examine the association between firm performance and tax avoidance. Most studies of the ETR use Compustat (e.g. Gupta and Newberry, 1997; Armstrong et al., 2012; Dyreng et al., 2016). Loretz and Moore (2013) uses a combination of Compustat and Orbis. The advantage of Orbis is a lot of information of public and private firms in European countries (Orbis, 2017).

First, I investigate the association between firm performance, measured as return on assets (ROA) and tax avoidance, measured as GAAP ETR. Prior studies show different results for the association, both in sign as in significance (see table 1). The results of this thesis show that the relation between ROA and GAAP ETR is negative and significant. Secondly, I divide the observations of the whole sample in quartiles based on ROA. The reason of dividing the sample in quartiles is to check for a potential non-linear relation between ROA and GAAP ETR. I repeat the regression for every quartile. The relation between ROA and GAAP ETR is negative and significant for every quartile. Better firm performance leads to more tax avoidance. This result supports the political power theory. The consistency of the sign in all subsamples does not give reasons for existence of two theories next to each other. Remarkable is that the coefficient of ROA on GAAP ETR becomes smaller if ROA becomes higher (higher quantile). The relation between firm performance and tax avoidance is more pronounced if firm performance is low. Thirdly, I add a squared term of ROA to the model. I examine whether the relation between ROA and GAAP ETR is a quadratic relation with this supplemented model. The fixed effects regression results give reasons for a nonlinear relation. The method of Lind

and Mehlum (2010) shows that the relation between ROA and GAAP ETR is a U-shape relation.

First, I find in the sensitivity analysis that the relation between ROA and GAAP ETR remains negative in a smaller sample for EA-19 and EU-15 countries. Secondly, the regression results for the dummy of loss in the previous year are not consistent with results in the literature (Lazăr, 2014). I delete every firm-year with a loss in the previous year to examine this difference. The coefficient of ROA on GAAP ETR remains negative. The relation between ROA and GAAP ETR is less pronounced if firms do not have a loss in the previous year. Thirdly, to get more insight in the relation between ROA and GAAP ETR I divide the sample in eight equal groups based on ROA. The regression results show also a positive relation between firm performance and tax avoidance. But the eight subsamples in the model with the squared term give contradictory regression results compared to the four subsamples. Possible are the results dependent of the sample.

1.4 Contribution

This thesis contains a contribution to the literature and for policy makers. ROA is a significant determinant of GAAP ETR and important to takes into account in tax avoidance cases. To the best of my knowledge, there is no study that focuses on the association between firm performance and tax avoidance. Also there are not a lot of studies on the determinants of the ETR in the European Union. Unlike others (e.g. Delgado et al., 2014), I examine a sample of firms in all member states of the European Union. I find in the sensitivity analysis that the results are consistent at restricted samples with firms of the EA-19 and EU-15 countries. A recommendation in further research is to take into account the newest member states also. The independent variable ROA is divided in four equal subsamples. I find evidence that the method is a useful tool to get more insight in results. This evidence is important for other researchers, because it shows the possibility to examine the independent variable in subsamples and how other determinants of the effective tax rate can be studied. Policy makers have to deal with the fact that higher firm performance has a larger effect on tax avoidance compared with lower firm performance. Policy makers can make policy to prevent tax avoidance if they know which kind of firms avoids taxes.

1.5 Structure

This study is divided in seven chapters. Chapter 2 gives an overview of the recent literature about tax avoidance, determinants of the effective tax rate and corporate tax in the European

Union. Chapter 3 describes the theory behind firm performance and tax avoidance and gives the hypothesis of the thesis. The research design, the regression model and the description of the sample (selection) are presented in chapter 4. Chapter 5 contains the results. Robustness checks are presented in chapter 6. Chapter 7 concludes this study.

2. Related literature

Chapter two provides an overview about the related literature. Multiple studies are about tax avoidance, but the studies give different outcomes for the relation between firm performance and tax avoidance. Section one gives an overview about the most important tax avoidance research from starting point. Section two presents the studies on the determinants of the effective tax rate. This section includes a table of the most important related studies and their outcomes. Section three discusses about measuring tax avoidance. Section four explains corporate taxes in the European Union. The fifth section discusses the contribution of this study to the literature.

2.1 Tax avoidance research

The research of Wilkie (1988) is the starting point in the literature about determinants of the effective tax rate, as measure of tax avoidance. Before Wilkie (1988) the effective tax rate is studied only in intra-industry and intertemporal variety settings (e.g. Siegfried, 1974; Wilkie, 1988). Wilkie (1988) gives evidence for the relation between firm income and effective tax rates. Factors of firms with special tax rules (for example tax reductions through investments) and income have both influence on the relation provided that the factors and income are not perfectly correlated (Wilkie, 1988). Another important research is Gupta and Newberry (1997). This study uses as first a multivariate framework to examine multiple issues between determinants and variations in the ETR. Gupta and Newberry (1997) finds a significant and positive relation between ROA and ETR. The result emphasizes the importance to control for profitability of companies in testing the association between several determinants and ETR (Gupta and Newberry, 1997).

2.2 Determinants effective tax rates

After the research of Gupta and Newberry (1997) multiple studies examine the relation between possible determinants and tax avoidance. Table 1 gives an overview of some recent important studies. All described studies contain firm performance, mostly measured by ROA, in the analyses. Also the studies examine a lot of other determinants. The overview contains the sign between firm performance and the measure of tax avoidance (mostly ETR) including the significance level, the country of research and other (control) variables used in the research. There are no studies that focus on the association between (the different levels of) firm performance and tax avoidance. Watson (2015) looks to the relation between corporate social responsibility and tax avoidance and finds that firm performance moderates the relation, but

only by low profitable firms. The evidence of Watson (2015) suggests that more profitable firms pay more taxes, but the study does not give a conclusion.

2.3 Measuring tax avoidance

The actual cash taxes paid by a firm is mostly not available in the financial statements or other documents of firms (Hanlon and Heitzman, 2010). Tax return data is not available in most cases. If so, in almost all cases it is private data and the research is not replicable. Researchers have to use a computation to approach tax avoidance (Hanlon and Heitzman, 2010). Most researchers use effective tax rates to measure tax avoidance (see table 1), but more measures are available. Hanlon and Heitzman (2010) gives an overview about possible tax avoidance measures. The study divides the measures in six groups, effective tax rates, long-run effective tax rates, book-tax differences, discretionary or abnormal measures of tax avoidance, unrecognized tax benefits and tax shelter firms. The (long-run) effective tax rates are derived from the financial statements and for this reason in most cases available. Book-tax differences only measure non-confirming tax avoidance and therefore not always comparable between firms. Discretionary or abnormal measures are based on book-tax differences, abnormal accruals and other residual determinants. Everyone take other determinants is a problem and every researcher has to look to the research question to choose the right determinants. Unrecognized tax benefits measures are based on the accounting reserve for possible future tax obligations. These obligations are not certain on the moment of financial reporting. Unrecognized tax benefit measures are driven possible by obviously taxes and financial reporting incentives is important to realize. Using tax shelter firms as measure for tax avoidance is easy by research on international tax avoidance activities. But this measure has a lot of limitations. There is not known whether every company have activities in tax shelters and activities in a tax shelter is not always a reason to avoid taxes (Hanlon and Heitzman, 2010). Orbis (2018) gives limited data about book-tax differences and tax shelters. Availability and usability are the reasons to use an effective tax rate measure in this study.

2.4 European Union countries

Most studies examine tax avoidance in the USA. Tax avoidance and the effective tax rate in Europe are underexposed in the literature (Delgado et al., 2014). Also little studies examine multiple countries (Delgado et al., 2014). The sign and significance of the effect of ROA on the effective tax rate in the European Union have contradictory results when comparing the literature in table 1. For both reasons, this thesis takes companies from the 28 countries of the European Union and focuses on the context of the European Union.

The corporate tax rates of the member states of the European Union are very different (European Commission, 2017). The lowest statutory tax rate is 10% in Bulgaria and the highest is 35% in Malta (in 2016). The corporate statutory tax rate has gone down in average since 2009 (European Commission, 2017).

Graphic 1 shows the effective average tax rate (EATR)[1] from the 28 member states of the European Union at the years 2012 and 2016. The EATR is an indicator computed by applying the basic corporate tax law on an assumed investment (European Commission, 2017). Tax provisions and deductions which lower the EATR are in this computation important (European Commission, 2017). Graphic 1 shows the big differences in the EATR between countries. The graphic gives with some exceptions evidence for lower effective average tax rates in the newest member states of the European Union. Studies of the European Commission separate between the European Union member states (28 countries) and the Euro area (19 countries) and find lower average EATR's in case of all European Union members (European Commission, 2017).

2.5 Input for the literature

The contribution to the literature is threefold. First, little research examines the determinants of the effective tax rate (Loretz and Moore, 2013). Secondly, prior studies show that several factors of companies and industries have influence on tax behaviour, but the results and significance of the studies are mostly different.[2] No study focuses on the effect of firm performance on tax avoidance. Studies with ROA as a control variable give different conclusions about the relation between ROA and tax avoidance (especially in the EU). This study focuses on different subsamples of ROA, in which the literature does not paid attention on this possibility. Thirdly, little research is done to tax avoidance in the member states of the European Union. Also a lot of research focuses on one country and not on multiple countries (Delgado et al., 2014). For these reasons I focus on all member states of the European Union. The sample of Delgado et al. (2014) contains firms of the 15 oldest member states of the EU. My sample contains firms of all 28 member states of the European Union because results for all member states are important for knowledge and policy and I have data for all member states. Sensitivity checks are used which compute the model for the 19 countries of the Euro area and

[1] When speak about the effective average tax rate (EATR), this measure is important from the side of the government, which comes from law. The effective tax rate (ETR) is in this research from the side of the firms and is the dependent variable of this research.
[2] For other research see table 1. Also usable is Hanlon and Heitzman (2010).

the oldest 15 member states of the European Union to take into account the differences between the old and new member states.

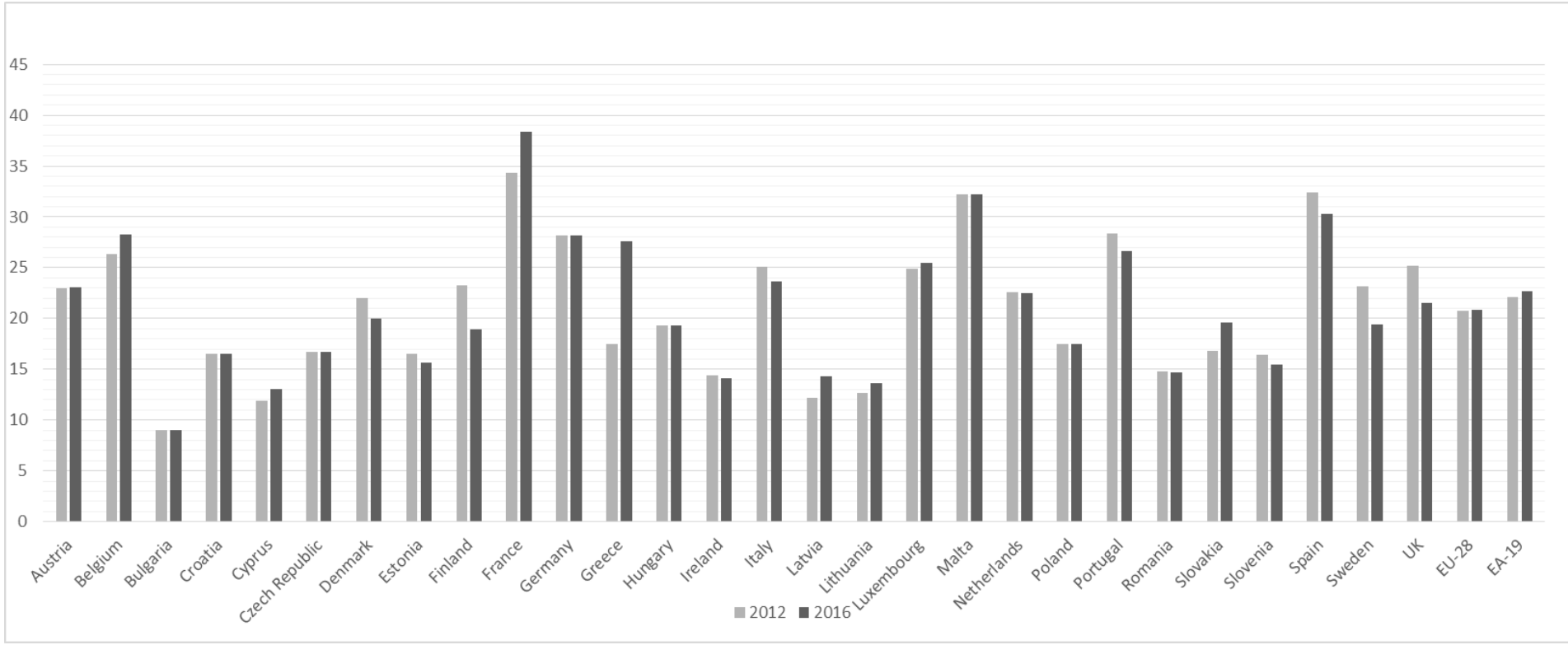
Table 1 Overview literature about relation between ROA and tax avoidance

Research	Sign independent variable ROA	Significance level	Research country	Dependent variable	Other control variables
Armstrong et al. (2012)	+	GAAP ETR *** Cash ETR **	USA and S&P 500	GAAP ETR & Cash ETR	Managerial incentives, market capitalization, leverage, change in goodwill, new investment, foreign assets, geographic and industry complexity, tax fees
Cao and Cui (2017)	-	***	China	Total tax expense minus deferred tax expense/profit before tax & Total tax expense minus deferred tax expense/profit before interest and tax & Total tax expense minus deferred tax expense/pre-tax profit minus deferred tax expense scaled by statutory tax rate	Size, leverage and capital intensity
Delgado et al. (2014)	+	***	EU (15 countries)	Current ETR	Company size, leverage, capital intensity, inventory intensity, statutory tax rate
Dyreng et al. (2016)	Mixed results		United Kingdom	GAAP ETR	Size, leverage, intangibles, inventory intensity, R&D intensity, capital intensity, capital expenditures, firm use tax havens or not, year and firm fixed effects
Fernández-Rodríguez and Martínez-Arias (2014)	Brazil + Russia – India – China +	Brazil ** Russia *** India China ***	Brazil, Russia, India and China	Current ETR	Size, leverage, capital intensity, inventory intensity, year and industry
Gupta and Newberry (1997)	+	**	USA	Current world wide income tax expense/EBIT & Current world wide income tax expense/ operating CF before interest and taxes	Firm size, leverage, asset mix
Huang et al. (2013)	-	***	China	Current ETR	Size, leverage, innovation intensity, labour intensity, measures which holds the shares (other firms or government), tax reform, high-tech industry or not
Jaafar and Thornton (2015)	+	***	EU (14 countries)	Current ETR & Current tax expense/cash flow from operations	Tax haven, size, leverage, capital intensity, inventory intensity, statutory tax rate
Janssen (2005)	ETR 1^{J} – ETR 2^{J} +	ETR 1^{J} ETR 2^{J} **	Netherlands	(tax expense-(deferred tax provision$_t$ – deferred tax provision$_{t-1}$)/EBIT ($ETR1^{J}$) & (tax expense-(deferred tax provision$_t$ – deferred tax provision$_{t-1}$)/(Cash flow – (EBIT-earnings before interest)) ($ETR2^{J}$)	Size, capital intensity, international activities, leverage, company is public or listed
Kraft (2014)	-	***	Germany	GAAP ETR	Size, leverage, operating lease expense, free cash flow, foreign sales, growth and mature

Lazăr (2014)	+	**	Romania	Current corporate income tax expense/EBITDA & Current corporate income tax expense/Cash flow	Capital intensity, leverage, company size, labor intensity, provisions, loss in previous year, part of multinational, tax reform
Lee and Swenson (2012)	+		EU (23 countries)	Current ETR	Inventory, leverage, size, PPE, R&D expenses, statutory tax rate
Loretz and Moore (2013)	-	GAAP ETR Current ETR **	32 countries	GAAP ETR & Current ETR	Firm size, leverage, capital intensity, intangible assets, accruals
Minnick and Noga (2010)	+	**	All over the world	GAAP ETR & Cash ETR	Board characteristics, directors compensation, firm specific measures (size, book-to-market value and others)
Mladineo and Susak (2016)	-	**	Croatia	GAAP ETR	Size, leverage, capital intensity
Noor et al. (2008)	-	***	Malaysia	Current ETR & GAAP ETR	Size, leverage, capital intensity, inventory intensity, foreign operation, part of a multinational
Parisi (2016)	-	***	Italy	Current ETR	Size, debt-ratio, asset mix, labor productivity, age firm, export strategy
Richardson and Lanis (2007)	+	ETR 1^{R} ETR 2^{R} ***	Australia	GAAP ETR ($ETR1^{R}$) & income tax expense/operating cash flows ($ETR2^{R}$)	Size, leverage, asset mix, industry sector, tax reform and interaction terms
Stamatopoulos et al. (2016)	+	ETR 1^{S} ** ETR 2^{S} ** ETR 3^{S} *	Greece	Tax payable/net income before taxes ($ETR1^{S}$) & tax payable/operating result ($ETR2^{S}$) & tax payable/EBITDA ($ETR3^{S}$)	Size, leverage, capital intensity, inventory intensity, sector, location and region, legal form and export, crisis year or not
Watson (2015)	Mixed results		USA	Cash ETR	Corporate social responsibility measures, profit level dummy, corporate governance measure, discretionary accruals, shares held by institutional owners, cash and short-term investments, leverage, loss in previous years, foreign operations, fixed assets, intangible assets, equity income, research and development expenses, number of employees, sales growth, market value of equity, market-to-book ratio

The table contains an overview of recent studies on determinants of tax avoidance. This table does not contain all available studies because of the range. The most important and recent studies are recorded, especially studies which research country is (a country in) the European Union, because of my study focuses on the European Union. In all studies ROA is a control variable. The second column gives the sign of the relation between ROA and the tax avoidance measure. The third column contains the country/countries of research. The fourth column presents the measure of tax avoidance used in the study. The fifth column gives the other variables from the regression model of the study. ***, **, * denotes statistical significance at the 1%, 5% and 10% levels, respectively.

Graphic 1 Effective average tax rates (EATR) of the countries of the European Union, EU-28 and EA-19



Source data: European Commission (2017).

3. Theory and hypothesis

This chapter is about the theory behind the possible relation between firm performance and tax avoidance. Two theories, the political cost theory and the political power theory, give a possible explanation about the relation. Both theories are discussed in this chapter. The political cost theory is the subject in section one. Section two presents the political power theory. Section three gives the hypothesis of the study.

3.1 Political cost theory

A lot of research is about the relation between firm size and government regulations and pressure. Starting point is the study of Aichian and Kessel (1962). Aichian and Kessel (1962) points out that firms with higher profits have to deal with government interferences (through regulation) and public pressure. Also Jensen and Meckling (1978) states this finding because larger firms are more visible. Watts and Zimmerman (1978) develops the positive accounting theory. This theory is based on the assumption that managers operate on such manner to maximize their own utility and lobby about accounting standards in their own self-interest. The positive accounting theory explains how and why managers choose some accounting methods (Watts and Zimmerman, 1986). Watts and Zimmerman (1986) supports this theory with three hypotheses, the bonus plan hypothesis[3], the debt/equity hypothesis[4] and the political cost hypothesis.[5]

The political cost hypothesis states that the larger the company, the more managers try to lower the reporting earnings by using accounting standards to do not draw attention from the politicians (Watts and Zimmerman, 1986). The political process seems a contest for wealth transfers (Watts and Zimmerman, 1986). The wealth transfers are negative (political costs) or positive (political benefits) (Zimmerman, 1983). Political costs are for example corporate taxes and costs of compliance of laws. Political benefits are for example subsidies and receiving contracts or other payments (Mills, Nutter and Schwab, 2012). Firms deal on such manner to receive a positive net wealth transfer. Taxes, a part of the political cost, are for example paid to avoid larger negative net wealth transfers (Mills, Nutter and Schwab, 2012). Larger and more

[3] A manager of a company with bonus plans tries to shift earnings of the future to the current period in financial reporting Watts and Zimmerman (1986). (This hypothesis is not needed for this study and for that reason is not discussed further).
[4] A manager of a company with a high debt to equity ratio tries to shift earnings of the future to the current period in financial reporting Watts and Zimmerman (1986). (This hypothesis is not needed for this study and for that reason is not discussed further).
[5] Watts and Zimmerman (1986) called this hypothesis also the size hypothesis.

profitable firms engage in less tax avoidance compared to smaller and less profitable firms to avoid political scrutiny. Political scrutiny leads possible to other law or policy with a lower or negative net wealth transfer (e.g. Zimmerman, 1983; Rego, 2003; Mills, Nutter and Schwab, 2012).

Companies with low(er) earnings performance need tax avoidance to retain some after-tax profit (Watson, 2015). Also smaller and less profitable firms are less exposed to political scrutiny. Less political scrutiny makes avoiding more tax at lower political cost possible compared to companies with high earnings performance and more political scrutiny (e.g. Zimmerman, 1983; Mills, Nutter and Schwab; Watson, 2015). In the context of this thesis, the political cost theory suggests that better firm performance leads to lower tax avoidance and vice versa.

3.2 Political power theory

The opposite view is the political power theory. The idea behind the political power theory is first described by Siegfried (1972). Siegfried (1972) states that larger firms have a lower ETR compared to smaller firms. Three reasons support this principle. Firstly, larger firms have more resources. Resources make it possible to influence the political process in their own advantage (Siegfried, 1972). For example by lobbying activities (e.g. Guha, 2007; Belz et al., 2016). Secondly, larger firms have more resources to acquire and hire tax planning experts (Siegfried, 1972). Thirdly, regulation of the company's activities on such a manner to optimize the tax savings is more possible by large companies with more resources (Siegfried, 1972). Multiple studies find a negative relation between the size of the firm and the ETR (e.g. Richardson and Lanis, 2007; Lee and Swenson, 2012).[6] Mostly the studies focus on the relation between firm size and tax avoidance. But the political power theory is also applicable on the relation between firm performance and tax avoidance. Companies with better firm performance have in most cases more resources compared to companies with lower firm performance. More resources is the condition for the three assumptions.

3.3 Hypothesis

The political cost theory and the political power theory are theories with an opposite effect. In the literature are different but not conclusive results.[7] Because of the opposite effect no prediction or expectation can be made whether the direction of the relation between firm

[6] For a complete overview of studies on the relation between size and ETR I refer to Belz et al. (2016). This study focuses on the relation between firm size and ETR.
[7] Belz et al. (2016) shows in an overview the different results.

performance and tax avoidance is positive or negative. Both theories give reasons for an association between firm performance and tax avoidance. This presumption leads to the following hypothesis:

$H_0$1: Firm performance is associated with tax avoidance.

The objective of this study is to look whether firm performance is associated with tax avoidance. The possible sign of the relation is important just as whether one of the theories support the relation. Also I examine whether the results of the different subsamples give reasons for the existence of two theories beside each other.

4. Research design

This chapter is about the research design of the study. This study is a statistical analyses of data. The Libby boxes (appendix A) show the conceptual relation between the variables used in this research. The first section presents the regression model of the analyses. Section two discusses the measure of tax avoidance. The third section describes the measure of firm performance. Section four discusses the control variables add to the regression model. Section five is about the sample selection of the research. The sixth section presents the descriptive statistics and the correlation matrix.

4.1 Regression model

The basic regression model of this study is:

$$\text{GAAP ETR}_i = \alpha + \beta_1 \text{ROA}_i + \beta_2 \text{SIZE}_i + \beta_3 \text{LOSS}_i + \beta_4 \text{LEV}_i + \beta_5 \text{CAPIN}_i + \beta_6 \text{INVIN}_i + \beta_7 \text{RDIN}_i + \beta_8 \text{PROV}_i + \varepsilon \quad (1)$$

The following sections explain the factors.

4.2 GAAP effective tax rate

Tax avoidance is the dependent variable. An estimation is necessary to measure tax avoidance (Hanlon and Heitzman, 2010). Different proxies of tax avoidance exist (see §2.3). Effective tax rate measures are well-accepted and commonly used measures for tax avoidance (e.g. Hanlon and Heitzman, 2010; Dyreng et al., 2016). I use the GAAP effective tax rate (GAAP ETR) because of the availability of data for this measure. GAAP ETR is the "worldwide total income tax expenses divided by the worldwide total pre-tax accounting income" (Hanlon and Heitzman, 2010, p. 139-140). The worldwide total income tax expenses are all taxes (of profit and income) related to a particular accounting period, both paid, deferred and accrued tax (Orbis, 2018). GAAP ETR is the average tax paid per euro of income (Hanlon and Heitzman, 2010). GAAP ETR is affected by changes in the tax accounting accruals and reflect non-conforming tax avoidance, but does not reflect strategies that defer taxes (Hanlon and Heitzman, 2010). I compute GAAP ETR for every year of the research. GAAP ETR is an inverse measure of tax avoidance. A lower GAAP ETR means more tax avoidance. A higher GAAP ETR means less tax avoidance. The difference between the statutory tax rate and GAAP ETR shows tax avoidance in reality. The current effective tax rate is not used, because little

data is available on Orbis for this measure.[8] Orbis does not provide information for the cash effective tax rate, for this reason I cannot use this rate (Orbis, 2017).

4.3 Firm performance

The most important independent variable is firm performance. I measure firm performance by the return on assets (ROA), consistent with a lot of other studies (e.g. Minnick and Noga, 2010; Armstrong et al., 2012; Dyreng et al., 2016). Orbis provides this variable as the return on assets using net income, computed by the net income divided by total assets (Orbis, 2018).[9] I use ROA to measure firm performance because ROA expresses the decisions of managers (Vintilă et al., 2017). For example, the return on equity (ROE) measures the decisions of the shareholders (Vintilă et al., 2017) and is not important for this research. I use Stata to divide the sample based on ROA in four groups, the subsamples. The firms with the lowest ROA make group 1 until the firms with the highest ROA group 4. Table 2 gives an overview of the groups. I use this method to check for a potential non-linear relation between ROA and GAAP ETR and whether the data supports the theories. If the data supports the political cost theory, GAAP ETR have to be lower in the subsamples with the lowest ROA and vice versa (coefficient of ROA is positive). If the data supports the political power theory, GAAP ETR have to be lower in the subsamples with the highest ROA and vice versa (coefficient of ROA is negative). If the coefficient of ROA is different between the subsamples, the two theories are possible both supported.

Table 2 Groups of ROA

Group	% ROA of the sample	N (number of firms-years)
1	0-25	4850
2	26-50	4845
3	51-75	4846
4	76-100	4847

The groups are the subsamples of this study. The groups are based on the quantile computation by the return on assets of STATA.

4.4 Control variables

I use seven control variables in the regression model. Control variables help to prevent the influence of correlated omitted variables on the outcomes (Field, 2018). Most control variables are based on related and previous studies (see table 1). The first control variable is size (**SIZE**),

[8] The sample size reduces to a third of the current size.

[9] Technical note: The relation between GAAP ETR and ROA could potentially be mechanical because of the denominator of GAAP ETR and the nominator of ROA are the same. Net income and pre-tax income are the same measures. When income goes up, both GAAP ETR and ROA changes. GAAP ETR goes down (in the case that tax expenses do not changes) and ROA goes up. When incomes goes down, the effect is reversed. These effects give a mechanical relation. But in the case income goes up, tax expenses go up also and GAAP ETR remains the same. The mechanical relation does not exist. No problems exist in the analysis for this reason.

measured as the natural logarithm of total assets. Following Lazăr (2014), to deal with a tax refund through losses, the second control variable is a dummy for loss equals one if the firm has a net operating loss in the previous year and 0 if not (**LOSS**). The third control variable is leverage (**LEV**), one of the most frequently used control variables in the previous research (see table 1), measured as the long term debt divided by the total assets. Also I examine the asset mix contains of capital intensity ratio, inventory intensity ratio and the research & development (R&D) intensity ratio. Capital intensity ratio (**CAPIN**) is measured as the tangible fixed assets divided by the total assets. Inventory intensity ratio (**INVIN**) is measured as the value of the stock divided by the total assets. Orbis defines stock as the total inventories consisting of raw materials, products in progress and finished goods (Orbis, 2018). R&D intensity ratio (**RDIN**) is measured as the R&D expenses divided by the total assets. The seventh control variable is the provision ratio (**PROV**) because other research finds evidence (e.g. Zinn and Spengel, 2012; Lazăr, 2014; Cao and Cui, 2017) that provisions affect the effective tax rate of firms. The provision ratio is measured as the provisions divided by the total assets.

4.5 Sample selection

I use data from Orbis in this study. Orbis is a product of Bureau van Dijk and has information of companies all over the world (Orbis, 2017). I start to collect data from Orbis through select firms of the 28 member states of the European Union. The next step includes all variables used in the regression model or to compute the factors of the model. I only add industrial companies in this step, not banks and insurance companies. The data is searched for the period 2012 to 2016. I collect only for the net income (profit and loss for a period) the data from 2011 to 2016 to compute the lagged net income and make the dummy LOSS. After I compute the lagged net income and make the dummy LOSS I delete all the observations of 2011. I keep 55,645 firm-year observations from 11,129 unique firms.

Using Stata I drop the observations with missing data. I keep 30,234 firm-years observations from 9,878 unique firms. The next step is deleting observations which distort the data (see table 3). Following Zimmerman (1983) I delete firm-years with a negative tax expense and firm-years with loss before taxation. Firm-years with a negative tax expense because these firm-years have a tax refund and do not show the real tax liability of the year. Also I exclude firm-years with loss before taxation to avoid noise in the data (Zimmerman, 1983). I keep 19,864 firm-years observations from 7,555 unique firms. After these steps I compute the variables as described in section 4.2 to 4.4. I winsorize all using variables of the regression model except GAAP ETR and LOSS at the 1st and the 99th percentiles to control for extreme observations.

Following other research (e.g. Gupta and Newberry, 1997; Fernández-Roderíguez and Martinéz-Arias, 2014; Dyreng et al., 2016) I avoid influence of extreme high values of GAAP ETR on the result. For this reason observations with a GAAP ETR exceeding one are deleted. The sample selection process results in a sample of 19,406 observations and 7,453 unique firms (see table 3).

Table 3 Sample selection procedure

	Firm-years	Unique firms
Industrial firms on Orbis with available data	55,645	11,129
Less firm-years with missing data	30,234	9,878
Less firm-years with tax expenses < 0	24,451	8,822
Less firm-years with earnings before tax < 0	19,864	7,555
Less GAAP ETR>1	19,406	7,453

The table gives the sample selection procedure. Every step gives the firm-years and unique firms which remain in the sample.

4.6 Descriptive statistics and correlation matrix

Table 4 reports the descriptive statistics of the variables used in the regression model. The statistics in panel A are from the entire sample. Panel B to E present the descriptive statistics for every separate group of ROA, the subsamples. The effective tax rate of the entire sample is 23.5 percent. For the subsamples, ROA_{group1} has the highest mean of the GAAP ETR, 33.0 percent. GAAP ETR becomes smaller about the groups and ROA_{group4} has a mean for GAAP ETR of 17.8%. GAAP ETR seems to be smaller if ROA is higher. Interestingly, the means of loss (LOSS) and leverage (LEV) becomes smaller for the subsamples with higher ROA.

I test the normality of the variables by using the Skewness/Kurtosis tests for normality. The variables of this research are not distributed normally, so I use the Spearman rank's correlations. Table 5 reports the Spearman rank's correlation matrix between the variables. Almost all of the variables are significantly correlated. The highest correlations are between SIZE and LEV (0.414), between ROA and LEV (-0.330) and between GAAP ETR and ROA (-0.318).

I use the variance inflation factor (VIF) to check for multicollinearity. Table B.1 (see appendix B) presents the scores. All VIF values are below the 3.05 with exception of one score. 3.05 is below the critical value of ten, values of ten or more are worthy of concern (Field, 2018). The average VIF value of the fixed effects model by ROA_{group4} is 15.4. This value seems to be high, but is likely caused by the complex fixed effects structure. No reason exists to be concerned about multicollinearity.

Table 4 Descriptive statistics of GAAP effective tax rate and independent variables

Panel A - Descriptive statistics entire sample

	N	Mean	Median	Std. Dev.	Minimum	Q1	Q3	Maximum
GAAPETR	19406	0.235	0.220	0.156	0.000	0.145	0.299	1.000
ROA	19406	7.968	5.588	7.864	-1.050	2.805	10.363	42.939
SIZE	19406	11.843	11.610	2.360	6.973	10.037	13.463	17.663
LOSS	19406	0.111	0.000	0.314	0.000	0.000	0.000	1.000
LEV	19406	0.115	0.052	0.149	0.000	0.000	0.184	0.665
CAPIN	19406	0.224	0.162	0.215	0.000	0.050	0.333	0.901
INVIN	19406	0.126	0.099	0.126	0.000	0.012	0.196	0.557
RDIN	19406	0.021	0.001	0.044	0.000	0.000	0.021	0.270
PROV	19406	0.038	0.015	0.060	0.000	0.004	0.043	0.342

Panel B - Descriptive statistics ROA_{group1}

	N	Mean	Median	Std. Dev.	Minimum	Q1	Q3	Maximum
GAAPETR	4,852	0.330	0.295	0.225	0.000	0.178	0.445	1.000
ROA	4,852	1.377	1.429	0.882	-1.050	0.647	2.133	2.805
SIZE	4,852	12.183	11.995	2.460	6.973	10.387	13.870	17.663
LOSS	4,852	0.227	0.000	0.419	0.000	0.000	0.000	1.000
LEV	4,852	0.161	0.117	0.167	0.000	0.008	0.257	0.665
CAPIN	4,852	0.265	0.204	0.245	0.000	0.055	0.408	0.901
INVIN	4,852	0.118	0.079	0.130	0.000	0.008	0.185	0.557
RDIN	4,852	0.012	0.000	0.032	0.000	0.000	0.006	0.270
PROV	4,852	0.039	0.015	0.063	0.000	0.003	0.044	0.342

Panel C - Descriptive statistics ROA_{group2}

	N	Mean	Median	Std. Dev.	Minimum	Q1	Q3	Maximum
GAAPETR	4,853	0.228	0.231	0.119	0.000	0.153	0.306	0.821
ROA	4,853	4.140	4.115	0.791	2.806	3.451	4.798	5.588
SIZE	4,853	12.418	12.252	2.365	6.973	10.640	14.129	17.663
LOSS	4,853	0.094	0.000	0.291	0.000	0.000	0.000	1.000
LEV	4,853	0.141	0.100	0.150	0.000	0.008	0.226	0.665
CAPIN	4,853	0.242	0.178	0.228	0.000	0.056	0.367	0.901
INVIN	4,853	0.121	0.091	0.126	0.000	0.011	0.186	0.557
RDIN	4,853	0.014	0.000	0.034	0.000	0.000	0.012	0.270
PROV	4,853	0.042	0.017	0.063	0.000	0.004	0.049	0.342

Panel D - Descriptive statistics ROA_{group3}

	N	Mean	Median	Std. Dev.	Minimum	Q1	Q3	Maximum
GAAPETR	4,850	0.205	0.213	0.101	0.000	0.145	0.272	0.908
ROA	4,850	7.638	7.457	1.354	5.589	6.470	8.728	10.363
SIZE	4,850	11.930	11.707	2.281	6.973	10.141	13.658	17.663
LOSS	4,850	0.060	0.000	0.238	0.000	0.000	0.000	1.000
LEV	4,850	0.105	0.047	0.137	0.000	0.000	0.163	0.665
CAPIN	4,850	0.216	0.160	0.202	0.000	0.051	0.325	0.901
INVIN	4,850	0.133	0.111	0.126	0.000	0.016	0.202	0.557
RDIN	4,850	0.021	0.002	0.041	0.000	0.000	0.025	0.270
PROV	4,850	0.040	0.016	0.060	0.000	0.004	0.048	0.342

Panel E - Descriptive statistics ROA_{group4}

	N	Mean	Median	Std. Dev.	Minimum	Q1	Q3	Maximum
GAAPETR	4,851	0.178	0.196	0.095	0.000	0.119	0.234	0.952
ROA	4,851	18.722	15.775	8.383	10.364	12.696	21.663	42.939
SIZE	4,851	10.839	10.517	1.992	6.973	9.379	11.969	17.663
LOSS	4,851	0.061	0.000	0.240	0.000	0.000	0.000	1.000
LEV	4,851	0.054	0.000	0.114	0.000	0.000	0.054	0.665
CAPIN	4,851	0.173	0.126	0.164	0.000	0.041	0.262	0.901
INVIN	4,851	0.132	0.112	0.122	0.000	0.015	0.206	0.557
RDIN	4,851	0.037	0.010	0.060	0.000	0.000	0.046	0.270
PROV	4,851	0.031	0.012	0.054	0.000	0.003	0.031	0.342

The table shows the descriptive statistics of the entire sample in panel A. For each subsample, panel B until E present the descriptive statistics. Variable definition: GAAP ETR is the worldwide total income tax expense divided by the worldwide total pre-tax accounting income, ROA is the net income divided by total assets, SIZE is the natural logarithm of total assets, LOSS is a dummy for loss equals one if the firm have a net operating loss in the previous year and 0 if not, LEV is the long term debt divided by the total assets, CAPIN is tangible fixed assets divided by the total assets, INVIN is the value of the stock divided by the total assets, RDIN is the R&D expenses divided by the total assets, and PROV is provisions divided by the total assets. ROA_{group1}, ROA_{group2}, ROA_{group3} and ROA_{group4} are the subsamples based on ROA.

Table 5 Correlation matrix entire sample

	GAAPETR	ROA	SIZE	LOSS	LEV	CAPIN	INVIN	RDIN	PROV
GAAPETR	1								
ROA	-0.318 ***	1							
SIZE	0.199 ***	-0.223 ***	1						
LOSS	0.008	-0.198 ***	-0.064 ***	1					
LEV	0.125 ***	-0.330 ***	0.414 ***	0.057 ***	1				
CAPIN	0.054 ***	-0.125 ***	0.102 ***	-0.017 **	0.227 ***	1			
INVIN	0.072 ***	0.057 ***	-0.132 ***	-0.060 ***	-0.090 ***	0.191 ***	1		
RDIN	-0.021 ***	0.292 ***	-0.126 ***	-0.073 ***	-0.241 ***	-0.077 ***	0.215 ***	1	
PROV	0.202 ***	-0.041 ***	0.287 ***	-0.015 **	0.047 ***	0.176 ***	0.104 ***	0.188 ***	1

This table presents the Spearman rank's correlations between the variables. Variable definition: GAAP ETR is the worldwide total income tax expense divided by the worldwide total pre-tax accounting income, ROA is the net income divided by total assets, SIZE is the natural logarithm of total assets, LOSS is a dummy for loss equals one if the firm have a net operating loss in the previous year and 0 if not, LEV is the long term debt divided by the total assets, CAPIN is tangible fixed assets divided by the total assets, INVIN is the value of the stock divided by the total assets, RDIN is the R&D expenses divided by the total assets, and PROV is provisions divided by the total assets. ***, **, * denotes statistical significance at the 1%, 5% and 10% levels, respectively.

5. Results

This chapter presents the results of the study. The first section discusses the results of the entire sample. Section two presents the results of the subsamples based on ROA. The third section introduces a model with a squared term to examine whether the relation between performance and tax avoidance is non-linear.

5.1 Results entire sample

Table 6 shows the results of the fixed effects regression model (1). The first column contains the regression results for the entire sample. The most important result is the relation between ROA and GAAP ETR. I find a negative (-0.005) and significant coefficient. The negative coefficient indicates that higher ROA leads to lower GAAP ETR and vice versa. Firms with better firm performance have a lower GAAP ETR and therefore more tax avoidance. This finding supports the political power theory. The result supports also the null hypothesis ($H_0 1$) that firm performance is associated with tax avoidance.

The control variables show that the effective tax rate is affected by other determinants. The estimated coefficient of SIZE is positive (0.002) and significant. This result is consistent with some other studies on tax avoidance of European firms (e.g. Delgado et al., 2014; Kraft, 2014; Jaafar and Thornton, 2015; Dyreng et al., 2016; Stamatopoulos et al., 2016). LOSS is positive (0.020) and significant, firms with a loss in the previous year have a higher GAAP ETR. This result is not consistent with the findings of Lazăr (2014). Lazăr (2014) introduces this determinant and finds a negative and significant relation between previous loss and tax avoidance. (I add a sensitivity check to control for this difference in section 6.2). With regard to leverage (LEV), the result shows a negative (-0.024) and significant effect on ETR. This finding supports the explanation that financing the firm with debt is desirable because of interest deductibility in corporate taxation (e.g. Delgado et al., 2014). In case of the asset mix, all the variables are positive and significant. The literature gives different results for the asset mix (e.g. Gupta and Newberry, 1997; Lee and Swenson, 2008; Fernández-Rodríguez and Martínez-Arias, 2014; Jaafar and Thornton, 2015; Dyreng et al., 2016). With respect to provisions, the regression result shows a positive and significant effect on ETR. This result is in agreement with prior research (e.g. Zinn and Spengel, 2012; Lazăr, 2014; Cao and Cui, 2017). Provisions are allowed differently between financial accounting and tax accounting. Also provisions are measured in another way (Zinn and Spengel, 2012).

5.2 Results subsamples

Table 6 presents also the results of the subsamples. With regard to ROA, the most important result, the coefficient is negative and significant for every different subsample. The results support $H_0$1 that firm performance is associated with tax avoidance. The negative signs

Table 6 Fixed effects regression results model (1)

	Entire sample		$ROA_{group\ 1}$		ROA_{group2}		ROA_{group3}		ROA_{group4}	
Intercept	0.229	***	0.372	***	0.219	***	0.181	***	0.232	***
ROA	-0.005	***	-0.093	***	-0.013	***	-0.004	***	-0.002	***
SIZE	0.002	***	0.003	**	0.003	***	0.004	***	0.001	
LOSS	0.020	***	-0.002		-0.020	***	-0.041	***	-0.044	***
LEV	-0.024	***	-0.047	**	-0.039	***	-0.047	***	-0.021	*
CAPIN	0.011	**	0.004		0.010		0.011		0.032	***
INVIN	0.050	***	0.038		0.060	***	0.074	***	0.049	***
RDIN	0.117	***	0.474	***	0.154	***	0.080	**	-0.006	
PROV	0.170	***	0.355	***	0.152	*	0.077	***	0.083	***
Country FE	YES		Yes		Yes		Yes		Yes	
Adj. R^2	0.161		0.215		0.145		0.141		0.114	
F-statistic	107.000		38.940		24.520		23.730		18.810	
P-value	0.000		0.000		0.000		0.000		0.000	

The table shows the results of the fixed effects regression of ROA and the control variables on GAAP ETR. Variable definition: GAAP ETR is the worldwide total income tax expense divided by the worldwide total pre-tax accounting income, ROA is the net income divided by total assets, SIZE is the natural logarithm of total assets, LOSS is a dummy for loss equals one if the firm have a net operating loss in the previous year and 0 if not, LEV is the long term debt divided by the total assets, CAPIN is tangible fixed assets divided by the total assets, INVIN is the value of the stock divided by the total assets, RDIN is the R&D expenses divided by the total assets, and PROV is provisions divided by the total assets. ROA_{group1}, ROA_{group2}, ROA_{group3} and ROA_{group4} are the subsamples based on ROA. ***, **, * denotes statistical significance at the 1%, 5% and 10%, respectively.

indicates that higher ROA, better firm performance, leads to lower GAAP ETR, more tax avoidance. This result supports the political power theory. Firms with better firm performance have a lower GAAP ETR and therefore more tax avoidance. The consistency of the sign in all subsamples does not give reasons for existence of two theories next to each other.

That the coefficient of ROA on GAAP ETR becomes smaller if ROA becomes higher (higher ROA_{group}) is remarkable. The subsamples with a lower ROA affirm more the association between ROA and GAAP ETR. For example the effect of ROA on GAAP ETR is more than 45 times larger in ROA_{group1} compared to ROA_{group4}. It seems to be that the relation between ROA and GAAP ETR is non-linear. I introduce in paragraph 5.3 a squared term in the model to examine the possible non-linearity.

With respect to the control variables, the results are different compared to the results of the entire sample. SIZE continues positive and small, but is not significant in case of ROA_{group4}.

The coefficient of LOSS is negative in every subsample, but is not significant for $ROA_{group1.}$ Leverage (LEV) has a negative and significant effect on GAAP ETR for every subsample. The results of the asset mix are very different. CAPIN is only significant for ROA_{group4}. INVIN is positive and significant with the exception of ROA_{group1} which is not significant. RDIN is positive and significant for ROA_{group1}, ROA_{group2} and $ROA_{group3.}$ The coefficient becomes smaller if firm performance is higher. RDIN is negative for ROA_{group4}, but not significant. With regard to PROV, the relation between PROV and GAAP ETR is positive and significant for every subsample. Only the relation becomes less pronounced if firm performance is higher.

5.3 Quadratic relation

Above results seems to give evidence that the relation between ROA and GAAP ETR is not linear. I examine the data to look for evidence of a quadratic relation. I search for a U-shaped or inverted U-shaped relation between ROA and GAAP ETR (Haans, Pieters and He, 2016). Using the following (adjusted) regression model:

$$\text{GAAP ETR}_i = \alpha + \beta_1 \text{ROA}_i + \beta_2 (\text{ROA}_i)^2 + \beta_3 \text{SIZE}_i + \beta_4 \text{LOSS}_i + \beta_5 \text{LEV}_i + \beta_6 \text{CAPIN}_i + \beta_7 \text{INVIN}_i + \beta_8 \text{RDIN}_i + \beta_9 \text{PROV}_i + \varepsilon \qquad (2)$$

The data remains the same, only adding the squared ROA for each observation. Table 7 gives the results of the fixed effects regression model (2).

Table 7 Fixed effects regression model (2)

	Entire sample		$ROA_{group\ 1}$		ROA_{group2}		ROA_{group3}		ROA_{group4}	
Intercept	0.271	***	0.383	***	0.239	***	0.215	***	0.230	***
ROA	-0.015	***	-0.122	***	-0.023		-0.013		-0.001	*
ROA^2	0.000	***	0.012	***	0.001		0.001		0.000	
SIZE	0.001	***	0.003	**	0.003	***	0.004	***	0.001	
LOSS	0.005		-0.002		-0.020	***	-0.041	***	-0.044	***
LEV	-0.048	***	-0.047	**	-0.039	***	-0.047	***	-0.020	*
CAPIN	0.009	*	0.005		0.010		0.011		0.032	***
INVIN	0.053	***	0.039	*	0.060	***	0.074	***	0.049	***
RDIN	0.131	***	0.479	***	0.154	***	0.080	**	-0.007	
PROV	0.166	***	0.352	***	0.152	***	0.077	***	0.083	***
Country FE	Yes		Yes		Yes		Yes		Yes	
Adj. R^2	0.196		0.217		0.145		0.141		0.114	
F-statistic	132.280		38.250		23.840		23.090		18.290	
P-value	0.000		0.000		0.000		0.000		0.000	

The table shows the results of the fixed effects regression of model (2). Variable definition: GAAP ETR is the worldwide total income tax expense divided by the worldwide total pre-tax accounting income, ROA is the net income divided by total assets, SIZE is the natural logarithm of total assets, LOSS is a dummy for loss equals one if the firm has a net operating loss in the previous year and 0 if not, LEV is the long term debt divided by the total assets, CAPIN is tangible fixed assets divided by the total assets, INVIN is the value of the stock divided by the total assets, RDIN is the R&D expenses divided by the total assets, and PROV is provisions divided by the total assets. ROA_{group1}, ROA_{group2}, ROA_{group3} and ROA_{group4} are the subsamples based on ROA. ***, **, * denotes statistical significance at the 1%, 5% and 10%, respectively.

The coefficient of ROA^2 is significant in model (2). The relation between ROA and GAAP ETR seems non-linear (Haans, Pieters and He, 2016). I use the method of Lind and Mehlum (2010) to examine this relation. This method consists of three steps. The first step consists of looking to the coefficient and significance of ROA^2 (Lind and Mehlum, 2010). The coefficient is positive and significance in model (2) what points to a U-shape relation. The second step examines whether the estimated extremum point is in the data field of the sample (Lind and Mehlum, 2010). The estimated extremum point is 5.308 and is in the data field (see table 8). The third step studies whether the slope at begin and end of the data field is steep enough and the sign is different of both (Lind and Mehlum, 2010). I test the slope at the lowest and highest bound of the data field using Stata. Both are significant and the signs are different (see table 8). The relation between ROA and GAAP ETR is a U-shape is the conclusion of the three steps.

Table 8 U-shape test between ROA and GAAP ETR

	Lowest bound	Highest bound	Overall U-shape test
Interval ROA	-1.050	42.939	
Slope	-0.016	0.010	
T-statistic	-40.679	18.578	18.580
P-value	0.000	0.000	0.000

Method of the test by Lind and Mehlum (2010). The test is based on the data field of ROA and the relation between ROA and GAAP ETR.

Comparing the results of the model (2) with the results of model (1), the adjusted R^2 is only higher in model (2) for the entire sample and ROA_{group1}. The other subsamples remain the same. With respect to the entire sample in model (2), the coefficient of ROA is more negative (-0.015) compared to model (1). This finding confirms that firm performance has a negative effect on tax avoidance. The sign of the other variables does not change. Only LOSS is not significant in model (2). With regard to the subsample ROA_{group1}, the coefficient of ROA is more negative (-0.122 instead of -0.093). In this subsample the relation between ROA and GAAP ETR is more pronounced. The sign of the other variables does not change. Only the coefficient of INVIN is significant in model (2).

In the case of the subsamples ROA_{group2} and ROA_{group3} by model (2) the coefficient of ROA is not significant. The coefficient of ROA for subsample ROA_{group4} is only significant at p=0.10 and is smaller compared to model (1).

6. Robustness checks

This chapter contains several robustness checks to verify the results of chapter 5. In the first section I test whether the results are consistent if the sample only consists of Eurozone countries or the oldest EU-15 member states. Section two studies the effect of eliminating the firms with a loss in the previous year. I divide the entire sample in eight parts to get more insight in the relation between firm performance and tax avoidance in the third section.

6.1 EA-19 and EU-15 countries

Section 2.4 explains why this research studies all member states of the European Union. I check whether a difference exists between countries which use the euro as official currency and the other countries. The fixed effect regression model (1) is done again for the 19 Eurozone countries.[10] 7,319 observations of the entire sample from 2,227 unique firms (entire sample EA-19) remain. I use Stata to divide the entire sample (EA-19) based on ROA in four groups. Beginning with the firms with the lowest ROA in group 1 until the firms with the highest ROA in group 4 ($ROA_{group1(EA-19)}$, $ROA_{group2(EA-19)}$, $ROA_{group3(EA-19)}$ and $ROA_{group4(EA-19)}$).

Table 9 gives the results of the fixed effects regression model (1) when the sample only contains EA-19 countries. The adjusted R-squared remains the same for the entire sample (EA-19). The model does not explain more or less. The coefficient of ROA remains negative and significant, only changes from -0.005 to -0.009. The relation between ROA and GAAP ETR is more pronounced. With respect to the control variables, the signs remain the same, only the coefficients change, but the differences are not worth mentioning.

Table 9 gives also the results of the subsamples ($ROA_{group1(EA-19)}$, $ROA_{group2(EA-19)}$, $ROA_{group3(EA-19)}$ and $ROA_{group4(EA-19)}$). With regard to ROA, the results are similar to the results of the subsamples (ROA_{group1}, ROA_{group2}, ROA_{group3} and ROA_{group4}) of the entire sample. The effect of ROA on GAAP ETR is more pronounced by firms with a lower ROA comparing by firms with higher levels of ROA. It supports the finding that the relation between ROA and GAAP ETR seems to be a quadratic function. Also the negative coefficient confirms the political power theory which suggests that better performance leads to higher tax avoidance. In the case of the control variables the sign remains for all variables the same, with exception of RDIN in

[10] Eurozone: Austria, Belgium, Cyprus, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Portugal, Slovakia, Slovenia and Spain. Source: European Union (2018a).

$ROA_{group4(EA-19)}$ (positive instead of negative). The coefficients and significance are very different, but in this case not very important.

Table 9 Fixed effects regression results model (1) for EA-19 countries

	Entire sample (EA-19)		$ROA_{group1(EA19)}$		$ROA_{group2(EA19)}$		$ROA_{group3(EA19)}$		$ROA_{group4(EA19)}$	
Intercept	0.226	***	0.374	***	0.236	***	0.178	***	0.105	***
ROA	-0.009	***	-0.114	***	-0.012	**	-0.005	*	-0.002	***
SIZE	0.002	**	0.003		0.001		0.004	***	0.007	***
LOSS	0.020	***	-0.008	*	-0.024	**	-0.057	***	-0.055	***
LEV	-0.056	***	-0.067		-0.062	***	-0.092	***	-0.030	
CAPIN	0.039	***	0.038		0.025	*	0.038	***	0.052	***
INVIN	0.110	***	0.051		0.138	***	0.127	***	0.176	***
RDIN	0.257	***	0.312	*	0.229	*	0.089		0.089	***
PROV	0.192	***	0.440	***	0.247	***	0.056		0.053	
Country FE	YES		YES		YES		YES		YES	
Adj. R^2	0.161		0.174		0.114		0.165		0.208	
F-statistic	54.820		15.850		10.090		14.910		19.45	
P-value	0.000		0.000		0.000		0.000		0.000	
N	7,319		1,830		1,830		1,830		1,829	

This table presents the results of the fixed effects regression of ROA and the control variables on GAAP ETR of the EA-19 countries. Variable definition: GAAP ETR is the worldwide total income tax expense divided by the worldwide total pre-tax accounting income, ROA is the net income divided by total assets, SIZE is the natural logarithm of total assets, LOSS is a dummy for loss equals one if the firm have a net operating loss in the previous year and 0 if not, LEV is the long term debt divided by the total assets, CAPIN is tangible fixed assets divided by the total assets, INVIN is the value of the stock divided by the total assets, RDIN is the R&D expenses divided by the total assets, and PROV is provisions divided by the total assets. $ROA_{group1(EA-19)}$, $ROA_{group2(EA-19)}$, $ROA_{group3(EA-19)}$ and $ROA_{group4(EA-19)}$ are the subsamples based on ROA. ***, **, * denotes statistical significance at the 1%, 5% and 10%, respectively.

Also I examine model (2) again for the EA-19 countries (see appendix B table B.2). The results are consistent with the results in table 7. The results and the method of Lind and Mehlum (2010) confirm that the relation between ROA and GAAP ETR seems to be a quadratic function (see appendix B table B.3).

Following Delgado et al. (2014) I examine the regression models also for the EU-15 countries[11], to exclude the newest member states of the European Union which have generally lower corporate tax rates (European Union, 2017). The results for model (1) and (2) are consistent with table 6 and 7. The results confirm that ROA is associated with GAAP ETR. When ROA becomes higher, the effect of ROA on GAAP ETR becomes less pronounced. The results confirm the quadratic relation between ROA and GAAP ETR.[12] A possible reason for the

[11] Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden and United Kingdom. Source: European Union (2018b).

[12] The results are consistent and similar with table 6 and 7 and are not presented in this thesis for that reason.

difference between this thesis and the study of Delgado et al. (2014) can be the period of the sample.

6.2 Loss in previous years

The regression result for LOSS in the entire sample for model (1) and (2) are different compared to Lazăr (2014). The study of Lazăr (2014) contains also a robustness check without firms with a loss in the previous year. The coefficients of capital intensity and profitability become higher. Lazăr (2014) sees the test without firms with a loss in the previous year as an additional check for the results on profitability. Loss gives possibilities for tax deductions. Following Lazăr (2014) I test regression model (1) and (2) for the firm-years without a loss in the previous year. The sample without firm-years with a loss consists of 17,258 firm-years from 6,715 unique firms (entire sample LOSS).

Table 10 gives the results of regression model (1). The coefficient for ROA in the entire sample is not change. The coefficients of ROA for the subsamples $ROA_{group1(LOSS)}$, $ROA_{group2(LOSS)}$ and $ROA_{group4(LOSS)}$ are less negative compared to the results in table 6. The relation between ROA and GAAP ETR is less pronounced. These results do not confirm the findings of Lazăr (2014), which coefficient of ROA increases without firm-years with a loss in the previous year. The relation between ROA and GAAP ETR seems to be less pronounced if firms do not have a loss in the previous year. Only the coefficient $ROA_{group3(LOSS)}$ is more negative.

Table B.4 (see appendix B) shows the results of the regression model (2) for the sample without firm-years with a loss in the previous year. The results are consistent with table 7 and confirm the previous findings.

Table 10 Fixed effects regression results model (1) for firm-years without a loss in the previous year

	Entire sample (LOSS)		$ROA_{group1(LOSS)}$		$ROA_{group2(LOSS)}$		$ROA_{group3(LOSS)}$		$ROA_{group4(LOSS)}$	
Intercept	0.241	***	0.386	***	0.214	***	0.190	***	0.340	***
ROA	-0.005	***	-0.082	***	-0.010	***	-0.005	***	-0.001	***
SIZE	0.001		0.002		0.003	***	0.004	***	0.001	
LEV	-0.030	***	-0.072	***	-0.040	***	-0.045	***	-0.022	*
CAPIN	0.008		0.004		0.011		0.006		0.031	***
INVIN	0.052	***	0.043	**	0.067	***	0.070	***	0.047	***
RDIN	0.097	***	0.473	***	0.104	**	0.032		-0.024	
PROV	0.153	***	0.293	***	0.109	***	0.097	***	0.084	***
Country FE	YES		YES		YES		YES		YES	
Adj. R^2	0.160		0.226		0.159		0.138		0.106	
F-statistic	97.820		38.100		25.010		21.330		16	
P-value	0.000		0.000		0.000		0.000		0.000	
N	17,258		4,315		4,314		4,315		4,314	

This table presents the results of the fixed effects regression of ROA and the control variables on GAAP ETR of the sample without the firm-years with a loss in the previous year. Variable definition: GAAP ETR is the worldwide total income tax expense divided by the worldwide total pre-tax accounting income, ROA is the net income divided by total assets, SIZE is the natural logarithm of total assets, LOSS is a dummy for loss equals one if the firm have a net operating loss in the previous year and 0 if not, LEV is the long term debt divided by the total assets, CAPIN is tangible fixed assets divided by the total assets, INVIN is the value of the stock divided by the total assets, RDIN is the R&D expenses divided by the total assets, and PROV is provisions divided by the total assets. $ROA_{group1(LOSS)}$, $ROA_{group2(LOSS)}$, $ROA_{group3(LOSS)}$ and $ROA_{group4(LOSS)}$ are the subsamples based on ROA. ***, **, * denotes statistical significance at the 1%, 5% and 10%, respectively.

6.3 Split subsamples

I split the entire sample in 8 parts instead of 4 based on ROA to get more insights in the results of chapter 5. ROA_{group1} becomes $ROA_{group1a}$ and $ROA_{group1b}$ etc. Table 11 gives the regression results of model (1) for the 8 new subsamples. (The entire sample remains the same and is not included in the table). The first four new subsamples ($ROA_{group1a}$ until $ROA_{group2b}$) have a negative and significant coefficient for ROA. The coefficient of $ROA_{group1a}$ is -0.142 and is more negative compared to the results in table 6. The relation between firm performance and tax avoidance is most pronounced by the firms with the lowest 12.5% of ROA. The difference with the coefficient of $ROA_{group1b}$ is large. The coefficient of ROA on GAAP ETR in $ROA_{group1b}$ (-0.053) is about half of the coefficient of ROA on GAAP ETR of $ROA_{group1a.}$ With respect to $ROA_{group2a}$ and $ROA_{group2b,}$ the coefficient of firm performance on tax avoidance becomes less negative if ROA becomes higher. The results of $ROA_{group3a}$ until $ROA_{group4a}$ are not significant. $ROA_{group4b}$ is negative (-0.002) and significant. The result of $ROA_{group4b}$ is the same as ROA_{group4} compared to table 6. The results of table 11 for $ROA_{group1a}$ until $ROA_{group2b}$ and $ROA_{group4b}$ support the null hypothesis, firm performance is associated with tax avoidance. Also

these results support the political power theory which suggests that better firm performance leads to more tax avoidance. Because of the results of $ROA_{group3a}$ until $ROA_{group4a}$ are not significant, the question is whether there is an effect of firm performance on tax avoidance when ROA is higher.

With respect to the control variables, there are different and no consistent results. The control variables are not important to discuss further in this case.

Table 12 gives the regression results of model (2) for the eight subsamples to look for a quadratic relation. The results are very different comparing with table 7. The coefficient of ROA on GAAP ETR for $ROA_{group1a}$ is negative and significant. But the coefficient of ROA^2 is also negative and significant. When I perform the method of Lind and Mehlum (2010) the result (table B.5 in appendix B) indicates an inverse U-shape relation, while paragraph 5.3 (and table 8) shows a U-shape relation. It seems to be that ROA_{group1} (= $ROA_{group1a}$ and $ROA_{group1b)}$ contains very different observations. The results could be dependent of the sample. Also I cannot study the results of firms with a negative pre-tax income through the distorted effect of tax deductions. In this case I cannot compare the results of ROA_{group1} with firms with a ROA below ROA_{group1}. My recommendation for further research is to study this remarkable findings in other samples.

The other results of table 12 are different from the previous findings. Also a lot of coefficients (especially of ROA and ROA^2) are not significant.

Table 11 Fixed effects regression model (1)

	$ROA_{group1a}$		$ROA_{group1b}$		$ROA_{group2a}$		$ROA_{group2b}$		$ROA_{group3a}$		$ROA_{group3b}$		$ROA_{group4a}$		$ROA_{group4b}$	
Intercept	0.375	***	0.313	***	0.226	***	0.191	***	0.223	***	0.136	***	0.212	***	0.281	***
ROA	-0.142	***	-0.053	***	-0.014	**	-0.008	*	-0.005		-0.003		-0.002		-0.002	***
SIZE	0.003		0.004	**	0.003	***	0.003	***	0.002	**	0.006	***	0.002	*	-0.001	
LOSS	-0.005		0.003		-0.014	*	-0.028	***	-0.047	***	-0.037	***	-0.027	***	-0.054	***
LEV	-0.010		-0.090	***	-0.024		-0.054	***	-0.039	**	-0.058	***	-0.034	**	-0.003	
CAPIN	0.010		0.002		0.000		0.020	**	0.003		0.022	**	0.033	***	0.036	***
INVIN	0.025		0.056	**	0.055	***	0.062	***	0.064	***	0.084	***	0.046	***	0.046	***
RDIN	0.811	***	0.033		0.297	***	0.054		0.106	**	0.061		-0.030		-0.001	
PROV	0.488	***	0.232	***	0.207	***	0.090	**	0.094	**	0.058	*	0.038		0.129	***
Country FE	YES		YES		YES		YES		YES		OMITTED		OMITTED		OMITTED	
Adj. R^2	0.181		0.116		0.134		0.150		0.153		0.126		0.126		0.121	
F-statistic	16.320		10.050		11.690		13.260		13.510		11.280		8.270		11.150	
P-value	0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000	
N	2427		2425		2426		2427		2425		2,425		2,426		2,425	

The table shows the results of the fixed effects regression of ROA and the control variables on GAAP ETR. Variable definition: GAAP ETR is the worldwide total income tax expense divided by the worldwide total pre-tax accounting income, ROA is the net income divided by total assets, SIZE is the natural logarithm of total assets, LOSS is a dummy for loss equals one if the firm have a net operating loss in the previous year and 0 if not, LEV is the long term debt divided by the total assets, CAPIN is tangible fixed assets divided by the total assets, INVIN is the value of the stock divided by the total assets, RDIN is the R&D expenses divided by the total assets, and PROV is provisions divided by the total assets. $ROA_{group1a}$, $ROA_{group1b}$, $ROA_{group2a}$, $ROA_{group2b}$, $ROA_{group3a}$, $ROA_{group3b}$, $ROA_{group4a}$ and $ROA_{group4b}$ are the subsamples based on ROA. ***, **, * denotes statistical significance at the 1%, 5% and 10%, respectively.

Table 12 Fixed effects regression model (2)

	$ROA_{group1a}$		$ROA_{group1b}$		$ROA_{group2a}$		$ROA_{group2b}$		$ROA_{group3a}$		$ROA_{group3b}$		$ROA_{group4a}$		$ROA_{group4b}$	
Intercept	0.383	***	0.375	***	0.128		-0.096		-0.400		0.560	**	0.201		0.245	***
ROA	-0.055	***	-0.114		0.044		0.111		0.188	*	-0.099	*	0.000		0.001	
ROA^2	-0.099	***	0.014		-0.008		-0.012		-0.015	**	0.005	*	0.000		0.000	
SIZE	0.003		0.004	**	0.003	***	0.003	***	0.002	**	0.006	***	0.002	*	-0.001	
LOSS	-0.005		0.003		-0.014	*	-0.028	***	-0.047	***	-0.037	***	-0.027	***	-0.054	***
LEV	-0.009		-0.090	***	-0.024		-0.054	***	-0.039	**	-0.058	***	-0.034	**	-0.002	
CAPIN	0.005		0.002		0.000		0.020	*	0.002		0.022	**	0.033	***	0.037	***
INVIN	0.027		0.056	**	0.055	***	0.062	***	0.064	***	0.084	***	0.046	***	0.046	***
RDIN	0.831	***	0.032		0.297	***	0.055		0.107	**	0.061		-0.030		0.000	
PROV	0.502	***	0.231	***	0.206	***	0.090	**	0.094	**	0.058	*	0.038		0.129	***
Country FE	YES		YES		YES		YES		YES		OMITTED		OMITTED		OMITTED	
Adj. R^2	0.203		0.115		0.133		0.150		0.154		0.127		0.092		0.122	
F-statistic	18.200		9.790		11.370		12.910		13.250		11.070		8.030		10.900	
P-value	0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000	
N	2427		2425		2426		2427		2425		2,425		2,426		2,425	

The table shows the results of the fixed effects regression of model (2). Variable definition: GAAP ETR is the worldwide total income tax expense divided by the worldwide total pre-tax accounting income, ROA is the net income divided by total assets, SIZE is the natural logarithm of total assets, LOSS is a dummy for loss equals one if the firm have a net operating loss in the previous year and 0 if not, LEV is the long term debt divided by the total assets, CAPIN is tangible fixed assets divided by the total assets, INVIN is the value of the stock divided by the total assets, RDIN is the R&D expenses divided by the total assets, and PROV is provisions divided by the total assets. $ROA_{group1a}$, $ROA_{group1b}$, $ROA_{group2a}$, $ROA_{group2b}$, $ROA_{group3a}$, $ROA_{group3b}$, $ROA_{group4a}$ and $ROA_{group4b}$ are the subsamples based on ROA. ***, **, * denotes statistical significance at the 1%, 5% and 10%, respectively.

7. Conclusion

This chapter concludes the thesis. The research question of this study is whether firm performance influences tax avoidance. First the chapter presents briefly the results of the study and answers the research question. Thereafter the limitations of this study are discussed. Finally I present some ideas for further research and the contribution of this thesis to the literature and policy makers.

The literature does not give a conclusive answer on the relation between firm performance and tax avoidance. In the studies on the determinants of the effective tax rate in Europe ROA has different results. The focus of this study is on the possible relation and the sign of this relation. Two theories supports a possible relation between ROA and tax avoidance, the political cost theory and the political power theory. The political cost theory suggests that better firm performance leads to lower tax avoidance and vice versa. Because politicians paid more attention on firms with higher profits and firms with lower firm performance needs tax avoidance. The political power theory suggests that better firm performance leads to more tax avoidance because of the availability of resources, to influence the political process or to hire tax experts etc. I study whether the relation between firm performance and tax avoidance differs for different levels of firm performance. For this reason is the sample divided in four groups and the regression is also done for every group.

The regression results of the entire sample show that the coefficient of regressing GAAP ETR on ROA is negative and significant. This result supports $H_0 1$ that firm performance is associated with tax avoidance. For every different subsample the coefficient of ROA is negative and significant. This result supports the political power theory. Better firm performance leads to more tax avoidance. The consistency of the sign for all subsamples does not give reasons for existence of two theories next to each other. Remarkable is the fact that the coefficient of ROA on GAAP ETR becomes smaller if ROA becomes higher. The relation between firm performance and tax avoidance is less pronounced if firm performance is high. I introduce a squared term in the model. The finding shows a U-shape relation between firm performance and tax avoidance.

Three robustness checks examine the results. The results are consistent if the sample only consist of EA-19 and EU-15 countries. Also the results are consistent if all firm-years with a loss in the previous year are deleted from the sample. The relation between ROA and GAAP ETR is less pronounced if firms do not have a loss in the previous year. The latest robustness

check splits the sample in eight parts. I create eight subsamples to get more insights in the relation. The results of model (1) are only negative and significant for the four subsamples with the lowest ROA with one exception. The relation between firm performance and tax avoidance seems to be most pronounced by the firms with the lowest 12.5% of ROA. The overall results of model (1) support the political power theory. The results of model (2) are contradictory with the results of the four subsamples (§5.3). It could be that the results are dependent of the sample.

This thesis has different limitations. First, the measure of tax avoidance, GAAP ETR, has limitations. GAAP ETR does not reflect strategies that defer taxes (Hanlon and Heitzman, 2010). Orbis gives limited data about book-tax differences and tax shelters. I cannot check the results with another measure of tax avoidance because of losing a lot of data or the absence of data. Deleting firm-years with a negative pre-tax income has also disadvantages. The insight in the relation between ROA and GAAP ETR is restricted because this thesis does not study firm-years with a negative ROA. The second limitation is the sample size. In the sample selection procedure I loss a lot of data. On the one hand the sample selection procedure is needed to prevent distortion, but a larger sample makes the results stronger. The third limitation is that the thesis does not take into consideration whether different industries have an effect on the relation between ROA and GAAP ETR.

Further research can focus on the (possible) quadratic relation between firm performance and tax avoidance. It is interesting to look of this quadratic relation also exists in other parts or countries of the world. Also a recommendation for further research is to take into consideration the industry effects. It is important for policy makers to know on which industry they have to focus.

The thesis has a contribution to the literature and the policy makers in the following ways. First, ROA is a significant determinant of the GAAP ETR and important to deal with in other studies. No study in the literature focuses on firm performance and tax avoidance on this manner. Also there are not a lot of studies on the determinants of the ETR in the European Union. Unlike others (e.g. Delgado et al., 2014) I take all member states of the European Union in the sample. I examine restricted samples with less states but the results are consistent. It is correct in further research to take into account the newest member states also. Dividing the independent variable ROA in quartiles leads to more insights. This thesis gives evidence that this method is a useful tool to get more insight in results. A recommendation is to look with this method also to other determinants of the ETR. The contribution for policy makers is that in the case of policy about tax avoidance they have to look and control firms with a higher firm performance.

References

Aichian, A.A., Kessel, R.A., 1962. Competition, Monopoly, and the Pursuit of Pecuniary Gain. *Aspect of Labor Economics,* 157-183 (Princeton University Press).

Armstrong, C.S., Blouin, J.L., Larcker, D.F., 2012. The incentives for tax planning. *Journal of Accounting and Economics 53*(1-2), 391-411.

Belz, T., Von Hagen, D., Steffens, C., 2016. Taxes and Firm Size: Political Cost or Political Power? Available at SSRN: https://ssrn.com/abstract=2697468.

Cao, J., Cui, Y., 2017. An Alternative View on Determinants of the Effective Tax Rate: Evidence from Chinese Listed Companies. *Emerging Markets Finance and Trade, 53*(5), 1001-1014.

Delgado, F.J., Fernández-Rodríguez, E., Martínez-Arias, A., 2014. Effective Tax Rates in Corporate Taxation: a Quantile Regression for the EU. *Engineering Economics 25*(5), 487-496.

Dyreng, S.D., Hoopes, J.L., Wilde, J.H., 2016. Public Pressure and Corporate Tax Behavior. *Journal of Accounting Research 54*(1), 147-186.

European Commission, 2017. Taxation Trends in the European Union; Data for the EU Member States, Iceland and Norway. Retrieved on November 14, 2017 from: https://ec.europa.eu/taxation_customs/business/economic-analysis-taxation/taxation-trends-eu-union_en.

European Union, 2018a. Europa; About the EU; Money and the EU. Retrieved on January 8, 2018 from: https://europa.eu/european-union/about-eu/money/euro_en#euro.

European Union, 2018b. Europa; About the EU. Retrieved on January 8, 2018 from: https://europa.eu/european-union/about-eu/countries_en#tab-0-1.

Fernández-Rodríguez, E., Martínez-Arias, A., 2014. Determinants of the Effective Tax Rate in the BRIC Countries, *Emerging Markets Finance and Trade, 50*(3), 214-228.

Field, A., (2018). *Discovering Statistics using IBM SPSS Statistics* (fifth edition). London, UK: SAGE Publications Ltd.

Guha, A., 2007. Company Size and Effective Corporate Tax Rate: Study on Indian Private Manufacturing Companies. *Economic and Political Weekly 42*(20), 1869-1874.

Gupta, S., Newberry, K., 1997. Determinants of the variability in corporate effective tax rates: Evidence from longitudinal data. *Journal of Accounting and Public Policy 16*(1), 1-34.

Haans, R.F.J., Pieters, C., He, Z., 2016. Thinking about U: theorizing and testing U- and inverted U-shaped relationships in strategy research. *Strategic Management Journal 37*(7), 1177-1195.

Hanlon, M., Heitzman, S., 2010. A review of tax research. *Journal of Accounting and Economics 50*(2-3), 127-178.

Huang, D., Chen, N., Gao, K., 2013. The tax burden of listed companies in China. *Applied Financial Economics 23*(14), 1169-1183.

Jaafar, A., Thornton, J., 2015. Tax havens and effective tax rates: an analysis of private versus public European firms. *The International Journal of Accounting 50*(4), 435-457.

Janssen, B., 2005. Corporate Effective Tax Rates in the Netherlands. *De Economist 153*(1), 47-66.

Jensen, M.C., Meckling, W.H., 1978. Can the Corporation Survive? *Financial Analysts Journal 34*(1), 31-37.

Kari, S., 2015. Corporate tax in an international environment – Problems and possible remedies. *VATT Working Papers 62*.

Kraft, A., 2014. What Really Affects German Firms' Effective Tax Rate? *International Journal of Financial Research 5*(3), 1-19.

Lazăr, S., 2014. Determinants of the Variability of Corporate Effective Tax Rates: Evidence from Romanian Listed Companies. *Emerging Markets Finance and Trade 50*(4), 113-131.

Lee, N., Swenson, C., 2012. Are Multinational Corporate Tax Rules as Important as Tax Rates? *The International Journal of Accounting 47*(2), 155-167.

Lind, J.T., Mehlum, H., 2010. With or Without U? The Appropriate Test for a U-Shaped Relationship. *Oxford Bulletin of Economics and Statistics 72*(1), 109-118.

Loretz, S., Moore, P.J., 2013. Corporate tax competition between firms. *International Tax and Public Finance 20*(5), 725-752.

Mills, L. F., Nutter, S. E., Schwab, C. M., 2012. The effect of political sensitivity and bargaining power on taxes: Evidence from federal contractors. *The Accounting Review 88*(3), 977-1005.

Minnick, K., Noga, T., 2010. Do corporate governance characteristics influence tax management? *Journal of Corporate Finance 16*(5), 703-718.

Mladineo, L., Susak, T., 2016. Determinants of Effective Tax Rate. *Economic and Social Development: Book of Proceedings*, 597-606.

Noor, R.M., Mastuki, N. A., Bardai, B., 2008. Corporate effective tax rates: A study on Malaysian public listed companies. *Malaysian Accounting Review, 7*(1), 1-20.

Orbis, 2017. Our Products. Retrieved on December 12, 2017 from http:// www.bvdinfo.com/en-gb/our-products/data/international/orbis.

Orbis, 2018. User Guide. Retrieved on January 8, 2018 from https://help.bvdinfo.com/mergedProjects/68_EN/Home.htm.

Parisi, V., 2016. The determinants of Italy's corporate tax rates: an empirical investigation. *Public and Municipal Finance (hybrid), 5*(4), 7-14.

Rego, S.O., 2003. Tax-avoidance activities of US multinational corporations. *Contemporary Accounting Research 20*(4), 805-833.

Richardson, G., Lanis, R., 2007. Determinants of the variability in corporate effective tax rates and tax reform: Evidence from Australia. *Journal of Accounting and Public Policy 26*(6), 689-704.

Siegfried, J., 1972. The relationship between economic structure and the effect of political influence: Empirical evidence from the corporation income tax program. *Ph.D. dissertation (University of Wisconsin)*, reported in Stickney and McGee (1982).

Siegfried, J.J., 1974. Effective Average U.S. Corporation Income Tax Rates. *National Tax Journal 27*(2), 245-259.

Stamatopoulos, I., Hadjidema, S., Eleftheriou, K., 2016. Explaining Corporate Effective Tax Rates Before and During the Financial Crisis: Evidence from Greece. *MPRA Paper No. 73787,* retrieved from https://mpra.ub.uni-muenchen.de/73787/.

Stickney, C.P., McGee, V.E., 1982. Effective corporate tax rates - The effect of size, capital intensity, leverage, and other factors. *Journal of Accounting and Public Policy 1*(2), 125-152.

Vintilă, G., Păunescu, R.A., Gherghina, Ş. C., 2017. Determinants of effective corporate tax rate. Empirical evidence from listed companies in Eastern European Stock Exchanges. *Theoretical and Applied Economics 24*, 37-46.

Watson, L., 2015. Corporate social responsibility, tax avoidance and earnings performance. *The Journal of the American Taxation Association 37*(2), 1-21.

Watts, R.L., Zimmerman, J.L., 1978. Towards a Positive Theory of the Determination of Accounting Standards. *The Accounting Review 53*(1), 112-134.

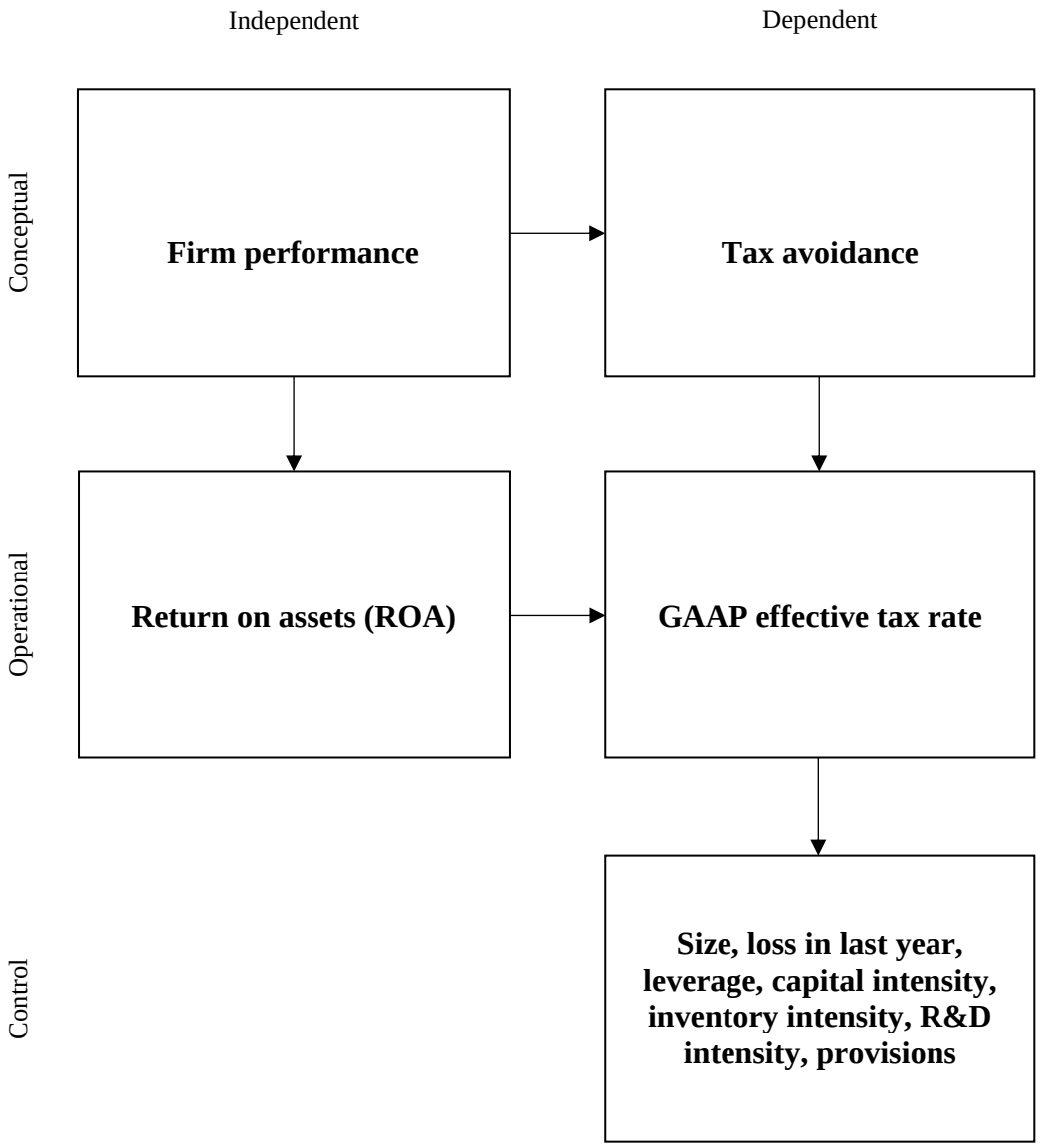
Watts, R.L., Zimmerman, J.L., 1986. *Positive accounting theory*. Englewood Cliffs, New Jersey: Prentice-Hall, Inc.

Wilkie, P.J., 1988. Corporate Average Effective Tax Rates and Inferences about Relative Tax Preferences. *The Journal of the American Taxation Association, 10*(1), 75-88.

Zimmerman, J.L., 1983. Taxes and firm size. *Journal of Accounting and Economics 5,* 119-149.

Zinn, B., Spengel, C., 2012. Book-tax Conformity: Empirical Evidence from Germany. *ZEW Discussion Paper No. 12-051.* Retrieved on July 14, 2017 from: https://ub-madoc.bib.uni-mannheim.de/32498/1/dp12051.pdf.

Appendix A Predictive Validity Framework



Appendix B Tables

Table B.1 Variance inflation factor analysis

	entire sample		ROA_{group1}		ROA_{group2}		ROA_{group3}		ROA_{group4}	
	VIF	1/VIF	VIF	1/VIF	VIF	1/VIF	VIF	1/VIF	VIF	1/VIF
ROA	1.17	0.857	1.05	0.954	1.01	0.989	1.03	0.975	1.06	0.946
SIZE	1.27	0.787	1.26	0.795	1.24	0.806	1.24	0.807	1.1	0.911
LOSS	1.04	0.964	1.05	0.953	1.02	0.978	1.03	0.971	1.05	0.948
LEV	1.25	0.800	1.22	0.817	1.23	0.815	1.18	0.846	1.07	0.936
CAPIN	1.08	0.922	1.07	0.935	1.08	0.925	1.06	0.944	1.07	0.935
INVIN	1.05	0.952	1.07	0.938	1.06	0.944	1.05	0.949	1.05	0.956
RDIN	1.1	0.913	1.05	0.957	1.06	0.939	1.06	0.947	1.04	0.959
PROV	1.07	0.938	1.08	0.925	1.09	0.919	1.07	0.933	1.03	0.974
Mean VIF	1.13		1.11		1.1		1.09		1.06	
Mean VIF-country fixed effects	3.02		2.61		2.36		3.04		15.4	

This table presents the VIF values of the variables for the entire sample and the four subsamples to check for multicollinearity. Variable definition: ROA is the net income divided by total assets, SIZE is the natural logarithm of total assets, LOSS is a dummy for loss equals one if the firm have a net operating loss in the previous year and 0 if not, LEV is the long term debt divided by the total assets, CAPIN is tangible fixed assets divided by the total assets, INVIN is the value of the stock divided by the total assets, RDIN is the R&D expenses divided by the total assets, and PROV is provisions divided by the total assets.

Table B.2 Fixed effects regression for EA-19 countries, model (2)

	Entire sample (EA-19)		$ROA_{group1(EA-19)}$		$ROA_{group2(EA-19)}$		$ROA_{group3(EA-19)}$		$ROA_{group4(EA-19)}$	
Intercept	0.268	***	0.373	***	0.237	**	0.095		0.113	***
ROA	-0.021	***	-0.066	***	-0.013		0.025		-0.004	**
ROA^2	0.000	***	-0.030	***	0.000		-0.003		0.000	
SIZE	0.002	**	0.003		0.001		0.004	***	0.007	***
LOSS	0.000		-0.010		-0.024	**	-0.057	***	-0.055	***
LEV	-0.087	***	-0.063	*	-0.062	***	-0.092	***	-0.032	
CAPIN	0.040	***	0.035		0.025	*	0.038	***	0.053	***
INVIN	0.113	***	0.051		0.138	***	0.128	***	0.175	***
RDIN	0.315	***	0.332	*	0.229	*	0.087		0.275	***
PROV	0.178	***	0.449	***	0.247	***	0.056		0.053	
Country FE	YES		YES		YES		YES		YES	
Adj. R^2	0.196		0.180		0.114		0.165		0.208	
F-statistic	67.150		15.880		9.710		14.370		18.75	
P-value	0.000		0.000		0.000		0.000		0.000	
N	7,319		1,830		1,830		1,830		1,829	

The table shows the results of the fixed effects regression of model (2) for the EA-19 countries. Variable definition: GAAP ETR is the worldwide total income tax expense divided by the worldwide total pre-tax accounting income, ROA is the net income divided by total assets, SIZE is the natural logarithm of total assets, LOSS is a dummy for loss equals one if the firm have a net operating loss in the previous year and 0 if not, LEV is the long term debt divided by the total assets, CAPIN is tangible fixed assets divided by the total assets, INVIN is the value of the stock divided by the total assets, RDIN is the R&D expenses divided by the total assets, and PROV is provisions divided by the total assets. $ROA_{group1(EA-19)}$, $ROA_{group2(EA-19)}$, $ROA_{group3(EA-19)}$ and $ROA_{group4(EA-19)}$ are the subsamples based on ROA. ***, **, * denotes statistical significance at the 1%, 5% and 10%, respectively.

Table B.3 U-shape test between ROA and GAAP ETR for Entire sample (EA-19)

	Lowest bound	Highest bound	Overall U-shape test
Interval	-1.050	42.939	
Slope	-0.022	0.017	
T-statistic	-27.272	11.502	11.500
P-value	0.000	0.000	0.000

Method of the test by Lind and Mehlum (2010). The extremum point is 23.824. The test is based on the data field of ROA and the relation between ROA and GAAP ETR.

Table B.4 Fixed effects regression results for firm-years without a loss in the previous year, model (2)

	Entire sample (LOSS)		$ROA_{group1(LOSS)}$		$ROA_{group2(LOSS)}$		$ROA_{group3(LOSS)}$		$ROA_{group4(LOSS)}$	
Intercept	0.279	***	0.418	***	0.284	***	0.245	***	0.341	***
ROA	-0.014	***	-0.139	***	-0.042	*	-0.018		-0.002	*
ROA^2	0.000	***	0.019	***	0.004		0.001		0.000	
SIZE	0.001		0.002		0.003	***	0.004	***	0.001	
LEV	-0.055	***	-0.074	***	-0.041	***	-0.045	***	-0.022	*
CAPIN	0.007		0.009		0.011		0.006		0.031	***
INVIN	0.054	***	0.043	**	0.067	***	0.070	***	0.047	***
RDIN	0.104	***	0.469	***	0.104	**	0.032		-0.024	
PROV	0.148	***	0.292	***	0.110	***	0.096	***	0.084	***
Country FE	YES		YES		YES		YES		YES	
Adj. R^2	0.194		0.234		0.159		0.138		0.106	
F-statistic	119.860		38.570		24.350		20.750		15.54	
P-value	0.000		0.000		0.000		0.000		0.000	
N	17,258		4,315		4,314		4,315		4,314	

The table shows the results of the fixed effects regression of model (2) of the sample without the firm-years with a loss in the previous year. Variable definition: GAAP ETR is the worldwide total income tax expense divided by the worldwide total pre-tax accounting income, ROA is the net income divided by total assets, SIZE is the natural logarithm of total assets, LOSS is a dummy for loss equals one if the firm have a net operating loss in the previous year and 0 if not, LEV is the long term debt divided by the total assets, CAPIN is tangible fixed assets divided by the total assets, INVIN is the value of the stock divided by the total assets, RDIN is the R&D expenses divided by the total assets, and PROV is provisions divided by the total assets. ROA_{group1}, ROA_{group2}, ROA_{group3} and ROA_{group4} are the subsamples based on ROA. ***, **, * denotes statistical significance at the 1%, 5% and 10%, respectively.

Table B.5 U-shape test between ROA and GAAP ETR for $ROA_{group1a}$

	Lowest bound	Highest bound	Overall U-shape test
Interval	-1.050	42.939	
Slope	0.153	-8.579	
T-statistic	4.127	-8.377	4.130
P-value	0.000	0.000	0.000

Method of the test by Lind and Mehlum (2010). The extremum point is -0.278. The test is based on the data field of ROA and the relation between ROA and GAAP ETR.