

# DETECTING TAX EVASION WHEN TAX AND ACCOUNTING EARNINGS MATCH

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## Abstract

The main purpose of the present study is to examine the tax behaviour of listed companies when operating in an accounting environment characterized by a high level of book - tax conformity. According to international practice, tax evasion is estimated by using two different measures: the tax evasion rate and the tax gap. After identifying the extent of tax evasion, a number of financial statement variables are examined in order to assess the financial characteristics of the tax aggressive firms. Companies with higher rates of tax evasion have more liquidity, more debt (especially short-term liabilities), are less effective and efficient in generating earnings and are smaller in size. Companies with higher amounts of tax gap are larger in size, have more liquidity, more debt (especially short-term liabilities) and are more effective. The outcomes of the present study may assist public bodies, such as tax authorities and regulatory bodies, as well as audit firms in detecting and deterring tax evasion.

**Keywords:** Earnings Manipulation, Book-Tax Conformity, Tax Evasion, Fraudulent Financial Reporting, Auditing

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## 1. INTRODUCTION

Although there is an extensive literature on corporate fraud and specifically on fraudulent financial reporting, a number of studies highlight the need for more research on corporate tax evasion as it has received relatively limited attention (Crocker and Slemrod, 2005; Tedds, 2006; Frank et al., 2009). This gap in the extant literature can be attributed to two reasons. The first one concerns the lack of available data regarding the outcome of the tax audits (Slemrod, 2004; Tedds, 2006; Frank et al., 2009). The second reason lies with the belief, widely held until recently, that the primary incentive of the listed companies is to inflate accounting earnings even at the cost of bearing a higher corporate tax (Mills and Newberry, 2001; Erickson et al., 2004). However, a number of egregious accounting scandals, involving companies like Enron, WorldCom and Tyco, have shown that companies may simultaneously evade taxes and manipulate accounting earnings upwards by using tax shelters (Slemrod, 2004; Desai, 2005; Desai and Dharmapala, 2009).

Following this spate of accounting scandals, accounting literature experienced a proliferation of studies in two main streams of research. The first one examines the divergent incentives of the firms when reporting for tax and for financial accounting purposes. Specifically, when managers manipulate accounting earnings upwards, they have to choose between inflating taxable income and consequently paying extra taxes or reporting the actual income to the tax authority and reporting a book-tax difference in their financial statements. Similarly, when a firm adopts a tax aggressive position it faces the question of whether to report lower accounting earnings or to

disclose the book-tax difference (Hanlon and Heitzman, 2010). The extent of book-tax differences and the level of total or discretionary accruals has been the focus of a large body of academic research regarding earnings management (Hanlon and Heitzman, 2010; Dechow et al., 2012).

The second stream of research that has recently attracted the attention of the scholars is the conformity between taxable and accounting earnings as a means to enhance financial reporting and restrain tax aggressiveness. Proponents argue that the alignment between taxable and accounting earnings will reduce aggressive financial reporting, since this would inevitably incur tax costs, and at the same time it will curtail tax aggressiveness as firms will avoid reporting lower profits to the shareholders (Desai, 2005; Whitaker, 2005). On the other hand, opponents of book-tax conformity claim that conformity will deteriorate the informativeness of earnings as tax policymakers will interfere in the standard-setting process and tax goals may prevail over reporting high earnings to capital markets (Hanlon et al., 2005; Hanlon et al., 2008; Atwood et al., 2012).

A monitoring mechanism that may affect managers' reporting decisions and mitigate corporate tax non-compliance, is tax enforcement (Hanlon et al., 2008). Certainly, firms are eager to engage in tax planning in order to save taxes. However, firms may also consider the potential costs of such a strategy, meaning the imposition of a severe amount of fines and penalties by the tax authority in case of detection (Wilson, 2009). Moreover, the propensity of the firms to evade taxes may also relate to their aversion to being labeled tax aggressive (Slemrod, 2004; Hanlon and Slemrod, 2009). Hoopes et al. (2012) provide evidence that U.S. public firms undertake less aggressive tax

positions when tax enforcement is stricter while Hanlon et al. (2014) report that higher tax enforcement by the tax authority is closely linked to enhanced financial reporting quality.

The present paper builds on extant literature by examining the tax behaviour of the Greek public companies (listed on Athens Stock Exchange) when they operated in an accounting environment characterized by a high level of book - tax conformity (one-book system)<sup>1</sup>. Specifically, the paper focuses on the period 2000-2004, since in 2005 Greece adopted International Financial Reporting Standards (IFRS) and moved from a one-book to a two-book system. As noted above, the separation between tax and financial reporting alters managers' reporting incentives. According to the Athens Stock Exchange Regulation, the Greek public companies are obligated to be frequently audited and to disclose the outcome of the tax audit. These company announcements provide a unique database of tax audit records. Overall, the results indicate that tax evasion of public companies is widespread in a highly aligned book-tax system. This constitutes downwards earnings manipulation. Additionally, the extent of tax evasion is found to be closely linked to firm size, effectiveness, debt burden, liquidity and audit firm.

The findings make several contributions to the literature. First, corporate tax aggressiveness is examined by relying on tax audit data. Relevant research is limited as the outcomes of the tax audits are confidential in most countries (Slemrod, 2004; Tedds, 2006; Frank et al., 2009) and researchers resort to the development of proxies in order to capture tax avoidance, tax aggressiveness and tax sheltering activities (Lietz, 2013). Second, the examination of corporate tax behaviour in a one-book system contributes to the debate about the costs and benefits of conforming book and taxable income. Empirical work on this relation is limited and calls for further research (Hanlon and Heitzman, 2010; Tang, 2015). Third, corporate reporting behaviour is examined when managers actually face the trade-off between tax evasion and reported profitability. Relevant research is based on the development of proxies for book-tax conformity (Atwood et al., 2012; Watrin et al., 2014; Tang, 2015; Blaylock et al., 2015).

Fourth, there is a growing literature examining the tax positions that firms undertake when the likelihood of a tax audit is high (Hoopes et al., 2012). The paper contributes to this line of research as it examines the tax behaviour of public firms that have the obligation to be frequently audited. Fifth, the paper investigates the relative significance of different firm characteristics regarding the intensity of tax evasion and builds a prediction model. This could be of use to the public bodies, such as tax authorities and regulatory bodies, as well as to the audit firms, in their efforts to detect and deter tax evasion.

The rest of the paper proceeds as follows. In section 2 the Greek accounting setting is described. Section 3 presents the methodology for determining the extent of tax evasion. In section 4 the sample of

the study is described. Section 5 covers literature review. Sections 6 and 7 present the empirical results regarding the prediction of the rate of tax evasion and the tax gap respectively. Section 8 concludes the study.

## 2. THE GREEK ACCOUNTING SETTING

Corporate tax evasion is a matter of primary importance with regard to a country's economic development and prosperity as it reduces public revenues and causes unfair competition in the marketplace. Nowadays, this issue has become even more crucial for Greece which is in the middle of the financial crisis and its economy relies heavily on financial support from the European Union, the International Monetary Fund and the European Central Bank. Government efforts to reduce budget deficit focus largely on tax policy and particularly on methods used to suppress tax evasion. The impact of the financial crisis became evident in the marketplace and Greece, which had been classified as a developed market since May 2001 according to MSCI index, was relegated back to an emerging market in November 2013. The Hellenic Capital Market Commission (HCMC) is the public body responsible for the regulation and monitoring of the capital market.

The Greek accounting framework has traditionally been tax-oriented (Ballas et al., 2010). Prior to the mandatory adoption of International Financial Reporting Standards (IFRS) in 2005, both public and private companies in Greece had their financial statements prepared according to the Greek GAAP. Since 2005, public firms publish their financial statements in accordance with IFRS whereas they apply Greek GAAP for tax purposes. Private companies still apply Greek GAAP both for financial reporting and for tax purposes. Therefore, the accounting regime that applies for public companies can be characterized as a "one-book system" before 2005 and a "two-book system" after 2005. The Greek GAAP emphasizes financial reporting conformity with tax rules (Spathis and Georgakopoulou, 2007), relies on historical-cost accounting measures, does not recognize fair value measurement and does not recognize the concepts of deferred tax (Tsalavoutas and Evans, 2010).

## 3. METHODOLOGY FOR DETERMINING THE EXTENT OF TAX EVASION

Public companies in Greece have to prepare three accounting statements: the tax statement, the parent-only financial statement and the consolidated financial statement. For the period under study (2000-2004), Greek GAAP was applicable for all three statements. Each company of the consolidated group is treated as a single entity for tax purposes. This means that the tax statement of the parent company is prepared on a single entity basis and not on a group basis. Corporate profits are taxed at a flat rate.

According to Athens Stock Exchange Regulation, the Greek public companies are obligated to be audited by the Internal Revenue Service frequently and to disclose the outcome of the tax audit on the website of Athens Stock Exchange (A.S.E.) as well as on their website for at

1 A "one-book system" refers to a system where the same accounting standards (local GAAP) apply both for financial and tax reporting. When IFRS are applied for financial reporting and local GAAP for tax reporting it is called a "two-book system".

least a year. They are also obliged to reveal the outcome of the most recent tax audits in any new prospectus that they release (i.e. in case of issuance of new shares, of a merger or an acquisition). These announcements and prospectuses, which are under the scrutiny of the Hellenic Capital Market Commission, are used as the main source of information for estimating the extent of tax evasion.

Although public firms must regularly be audited by the IRS, a tax audit takes place 3 to 4 years, on the average, after the fiscal year which it relates. The president of the Hellenic Capital Market Commission has often called for more timely tax enforcement. The audit is conducted at the business location and may cover one or more years.

$$\begin{aligned} \text{Tax Gap} &= \text{Post-Audit Tax Liability} - \text{Pre-Audit Tax Liability} = \\ &= (\text{Taxes Declared} + \text{Additional Tax Assessments}) - \text{Taxes Declared} = \text{Additional Tax Assessments} \end{aligned} \quad (1)$$

$$\begin{aligned} \text{Tax Compliance (\%)} &= (\text{Pre-Audit Tax Liability} / \text{Post-Audit Tax Liability}) \times 100 = \\ &= \{ \text{Taxes Declared} / (\text{Taxes Declared} + \text{Additional Tax Assessments}) \} \times 100 \end{aligned} \quad (2)$$

When tax compliance is expressed as a ratio, tax evasion is estimated as follows:

$$\text{Tax Evasion (\%)} = 100\% - \text{tax compliance (\%)} \quad (3)$$

The tax gap and the rate of tax evasion do not necessarily follow the same pattern. Holding the amount of the tax gap constant, a more profitable company will exhibit a lower tax evasion rate than a less profitable one. Examining earnings management strategies, Badertscher et al. (2009) focus on the rate of nonconforming earnings management rather than on the total amount. On the other hand, Hanlon et al. (2007) rely on the tax gap and not on the tax evasion rate. As they state: "when the reported tax is zero but there is a proposed deficiency of any magnitude the proposed deficiency rate becomes 100%, not distinguishing between firms that underreport \$10 of tax and those that underreport \$1 million of tax". In the present paper, both measures of tax evasion are analyzed as they convey different information regarding the extent of tax non-compliance.

It must be noted that consistent with prior studies (Hanlon et al., 2005; Atwood et al., 2012; Hoopes et al., 2012; Tang, 2015) the analysis is limited to profitable firms. A tax audit may detect underreporting of income in an unprofitable company which will probably not result in an increase in its tax liability. The reported income will merely be adjusted upwards (i.e. the income will still be negative but less than the one initially reported), resulting in a decrease in the tax loss carryforwards which offset future taxable income. The way that the existence of losses affects reporting behaviour is not examined in the present paper. According to Hanlon and Heitzman (2010) this is still an "open area to explore".

The amount of "additional tax assessments" that is taken into account comprises both the additional taxes owed and the fines and penalties that are imposed by the tax authority. This is primary due to the availability of data since the fines and penalties are not reported separately. This is a limitation of the current study. Nonetheless, the aggregate amount of the tax audit is not used arbitrarily. The public companies that are examined

Regardless of the number of years that are audited, a separate report is prepared for each year. In case the audit reveals underreporting of income, the auditor charges the additional taxes that are owed and imposes extra fines and penalties. The penalties that are imposed are determined by law and depend on the extent of underreporting and the type of the tax misstatement.

The extent of tax evasion is measured either as the difference between the taxes owed and the taxes actually paid (tax gap) or as the ratio of the reported to true tax liability (Andreoni et al., 1998; O.E.C.D., 2001; Slemrod, 2004; Hanlon et al., 2007). The two measures are expressed as follows:

are aware that they will be audited by the IRS in the following years. This means that the cost of the fines and penalties (that may be imposed) has been taken into account when they decide to underreport their income (Wilson, 2009). Moreover, it is the total amount imposed by the tax audit, and not just the extra taxes owed, that affects the cash flow of the firm and investor wealth (Crocker and Slemrod, 2005).

#### 4. SAMPLE OF THE STUDY

The sample of the study consists of the public companies listed on Athens Stock Exchange (A.S.E.) in years 2000-2004. The total number of companies amounts to 318. However, 21 companies were initially excluded because of their special characteristics. Specifically, the 10 companies of the "Equity Investment Instruments" sector were excluded as they are taxed under a special tax regime. According to Law 2579/1998, they are obligated to pay an annual tax of 3% on the average sum of their investments and cash. The 7 companies of the "Travel & Tourism" sector were also excluded as they are subject to a special tax based on the total gross tonnage of their ships (Law 27/1975). Two foreign companies were also dropped as they are not subject to the Greek tax law as well as two companies (i.e. the Bank of Greece and the Stock Exchange SA) whose shares are not traded. Following international practice (Tsalavoutas and Evans, 2010), 34 companies belonging to the banking, insurance and financial services sector were excluded due to their specific accounting and reporting requirements. The reduced sample comprises 263 listed companies.

The study focuses on the five year period 2000-2004. Years prior to 2000 are not examined because the Athens Stock Exchange crashed in 1999 (Louzis and Vouldis, 2013) and this might have significantly affected reporting incentives. Years after 2004 are also excluded from the analysis since Greek public companies moved from a one-book to a two-book system in 2005 with the mandatory adoption of IFRS. By manually examining companies' announcements and prospectuses data were acquired for the 134 out of the 263 companies of

the sample. By eliminating unprofitable firms, the final sample is reduced to 116 firms (305 firm-years). In all cases the IRS estimated that the companies did not comply with the tax law and imposed extra taxes plus fines and penalties.

The results provide evidence that tax evasion is widespread among public firms in a highly aligned book-tax system, complementing the study of Watrin et al. (2014) who report that high conformity between the single financial statement and the tax statement is associated with more downward earnings management. However, beyond the obvious incentive of saving money, strict tax enforcement may have also affected corporate reporting behaviour. Slemrod et al. (2001) posit that high-income taxpayers evade more taxes when they are certain that they will be audited by the IRS in order to ensure that their after-audit tax liability remains stable. Hoopes et al. (2012) parallel the tax reporting behaviour of firms to that of wealthy individuals, undertaking more aggressive tax positions when a tax audit is likely to occur so as to provide some negotiating room.

Although for the majority of the companies the outcome of the tax audit was available for more than one year, it was possible to obtain data for the whole period (2000-2004) only for the 14 out of the 116 companies of the sample. On the contrary, for 19 companies there are available data for four years, for 25 companies for three years, for 26 of the companies the data cover two years and for the rest 32 companies the outcome of the tax audit is only known for a year. Due to data limitation, the application of cross-sectional analysis was preferred to panel data analysis. Consistent with prior studies (Mohd Nor et al., 2010), the latest (most recent) audited year of each company was taken into account to assemble the sample. Consequently, the final sample consists of 116 observations/companies, 47 of which refer to 2004, 15 observations to 2003, 21 observations to 2002, 19 observations to 2001 and 14 observations for the year 2000.

As previously noted, the IRS revealed underreporting of income in all firm-years that were audited. Due to the short timeframe under study and taking into account that corporate tax law did not experience significant changes during that period, it is not anticipated that the year to which the audit refers has an impact on the extent of tax evasion. However, similar to Hanlon et al. (2007), a year dummy is included in the regression analysis to control for year effects. Moreover, a number of non-parametric tests are applied so as to examine whether there are any significant differences in the extent of tax evasion between the five years under study. Consistent with expectations, no significant differences were found<sup>2</sup>.

Table 1 shows some descriptive statistics of the sample. The mean rate of tax evasion is

estimated at 22.64% while the mean value of tax gap reaches €365,316. Both measures of tax evasion present high variability. Specifically, the rate of tax evasion ranges from 0.02% to 98.33% while it takes values between 7.36% and 32.11% for about half of the companies. Similarly, the amount of tax gap ranges from €4,030 to €3,747,719 for the whole sample and between €62,257 and €349,280 for about half of the companies. The coefficient of variation is calculated at 98% for the rate of tax evasion and at 171% for the tax gap.

**Table 1.** Descriptive statistics of the rate of tax evasion and of the tax gap

	% Tax Evasion	Tax Gap	
Mean	22.64	365,316	
Median	13.28	134,292	
Standard deviation	22.19	625,343	
Variation	492.34	391,053,841,673	
Range	98.31	3,743,688	
Minimum value	0.02	4,030	
Maximum value	98.33	3,747,719	
Quartiles			
	25	7.36	62,257
	50	13.28	134,292
	75	32.11	349,280

## 5. LITERATURE REVIEW

Accounting literature on corporate tax avoidance and evasion is relatively young and lacks a well-documented theoretical background (Tedds, 2006; Hanlon and Heitzman, 2010). On the contrary, there is an extensive literature examining firm-level determinants associated with fraudulent financial reporting. An outline of the findings of these studies is provided in Table 2. However, most of these studies focus on upward earnings management in a dual-reporting system (i.e. preparation of different reports for tax and financial accounting purposes) whereas the present paper focuses on corporate tax evasion (downward earnings management) in an accounting environment characterized by a high level of book - tax conformity (one-book system) where no deferred taxes are recognized.

Giles (1998) and Kanellopoulos (2002) have found a negative relation between company size and tax evasion indicating that smaller companies tend to be less compliant than larger ones. In a similar vein, Persons (1995) found a significant negative relation between firm size and the occurrence of corporate fraud. Persons (1995), Spathis (2002) and Guan et al. (2008) examined the relation between the liquidity of the companies and fraudulent financial reporting but they did not find any significant results. However, these studies focused on cases of upward earnings management. It is expected that in the case of tax evasion the short-term economic position of the companies may affect managerial decisions regarding tax compliance.

Giles (1998) found that companies' effectiveness is negatively related to tax evasion. Persons (1995) and Guan et al. (2008) reached similar results by focusing on cases of fraudulent financial reporting whereas the studies of Fanning and Cogger (1998) and Spathis (2002) did not yield any significant results. Kanellopoulos (2002) has found a strong negative relation between companies' efficiency and the rate of tax evasion.

<sup>2</sup> Specifically, differences between the five years for all the 116 firms of the sample were examined by Kruskal-Wallis test and Wilcoxon Signed Rank test. The results suggest that there are no significant differences. Similar analysis was conducted by taking into account only the 14 companies for which there are available data for the whole period without missing values. The Friedman, Kendall's W and Wilcoxon Signed Rank Test revealed that the rate of tax evasion in year 2000 is significantly smaller compared to the years 2002, 2003 and 2004. Significant differences were not found for the tax gap. For the sake of brevity, the outcomes of the tests are not reported here but are available upon request.

On the other hand, Summers and Sweeney (1998) found that the companies that manipulate their accounting data earn a higher return on invested capital whereas Persons (1995), Spathis (2002) and Guan et al. (2008) did not provide corroborative evidence.

**Table 2.** Factors associated with fraudulent financial reporting. Literature review.

<i>Study</i>	<i>Variable</i>	<i>Impact</i>
<b>Financial aspect: Company size</b>		
Persons (1995)	Total assets	Negative (-)
Giles (1998)	Sales	Negative (-)
	Earnings	Negative (-)
Kanellopoulos (2002)	Total assets	Negative (-)
<b>Financial aspect: Liquidity</b>		
Persons (1995)	Working capital / Total assets	Not found
Spathis (2002)	Working capital / Total assets	Not found
Guan et al. (2008)	Current ratio	Not found
<b>Financial aspect: Effectiveness</b>		
Persons (1995)	Sales / Total assets	Negative (-)
Fanning and Cogger (1998)	Sales / Total assets	Not found
	Sales / Accounts receivable	Negative (-)
Giles (1998)	Sales / Total assets	Negative (-)
Spathis (2002)	Sales / Total assets	Not found
	Sales / Inventory	Negative (-)
Guan et al. (2008)	Sales / Invested capital	Negative (-)
<b>Financial aspect: Efficiency</b>		
Persons (1995)	Earnings / Total assets	Not found
Summers and Sweeney (1998)	Earnings / Total assets	Positive (+)
Kanellopoulos (2002)	Earnings / Total assets	Negative (-)
	Earnings / Sales	Negative (-)
Spathis (2002)	Earnings / Total assets	Not found
Guan et al. (2008)	Earnings / Total assets	Not found
	Earnings / Sales	Not found
<b>Financial aspect: Asset structure</b>		
Persons (1995)	Current assets / Total assets	Positive (+)
Fanning and Cogger (1998)	Fixed assets / Total assets	Negative (-)
Guan et al. (2008)	Fixed assets / Total assets	Not found
<b>Financial aspect: Debt burden</b>		
Persons (1995)	Liabilities / Total assets	Positive (+)
Fanning and Cogger (1998)	Liabilities / Equity	Positive (+)
Kanellopoulos (2002)	Equity / Total assets	Negative (-)
Spathis (2002)	Liabilities / Total assets	Positive (+)
Erickson et al. (2006)	Liabilities / Total assets	Positive (+)

The asset structure of a firm has also been analyzed, indicating that firms that issue fraudulent financial statements are more likely to show a higher percentage of current assets to total assets (Persons, 1995; Fanning and Cogger, 1998; Guan et al., 2008). A plausible explanation is that companies find it easier to manipulate current assets accounts (such as inventory and accounts receivable) than fixed assets. The link between asset structure and tax evasion has not been examined. The companies that are struggling financially are considered to be more likely to commit accounting fraud in order benefit from the capital market. This notion is reinforced by the studies of Persons (1995), Fanning and Cogger (1998), Spathis (2002) and Erickson et al. (2006) which have found that the companies that issue falsified financial statements are in severe financial distress. It is also expected that companies with a high level of debt are prone to evade taxes in order to finance their obligations.

## 6. PREDICTION OF TAX EVASION RATE ON THE BASIS OF FINANCIAL STATEMENT DATA

### 6.1. Variable definition and model development

In order to investigate the relative significance of the different firm characteristics regarding the intensity of tax evasion a prediction model is developed. The dependent variable is the rate of tax evasion. Previous literature serves as the basis for the selection of the independent variables. The aim is to capture all aspects of corporate financial behaviour (liquidity, debt burden, effectiveness, efficiency, and size) that may affect managerial decisions regarding the extent of the underreporting of income. Since all the 116 companies in the sample are tax evaders, ordinary least squares regression analysis is applied. The model is formulated as follows:

$$\begin{aligned} \text{Log(Tax Evasion \%)} = & a + b_1 \text{Log(Acid)} + b_2 \text{Log(Debt/Assets)} + b_3 \text{Log(Current/Total.Liab.)} + \\ & + b_4 \text{Log(Asset.Turn.)} + b_5 \text{Log(Profit.Margin)} + b_6 \text{Log(Earnings)} + b_7 \text{Log(Tax)} + \varepsilon \end{aligned} \quad (4)$$

The variables are defined below:

$\text{Log(Tax Evasion \%)} =$  The log (base 10) of the rate of tax evasion;

$\text{Log(Acid)} =$  The log (base 10) of the acid-test ratio {(current assets - stocks)/current liabilities};

$\text{Log(Debt/Assets)} =$  The log (base 10) of the ratio of total debt/total assets;

$\text{Log(Current/Total.Liab.)} =$  The log (base 10) of the ratio of current liabilities/total liabilities;

$\text{Log}(\text{Asset.Turn.})$  = The log (base 10) of the asset turnover ratio (sales/total assets);

$\text{Log}(\text{Profit.Margin})$  = The log (base 10) of the net profit margin ratio (earnings before taxes/sales);

$\text{Log}(\text{Earnings})$  = The log (base 10) of the amount of earnings before taxes;

$\text{Log}(\text{Tax})$  = The log (base 10) of the tax burden, estimated as the amount of income tax paid divided by the accounting income.

Since the dependent variable is expressed as a ratio and the independent variables are expressed either as ratios or in euros log-linear analysis is applied in order to overcome problems of linearity

$$\begin{aligned} \text{Log}(\text{Tax Evasion \%}) = & 1.488 + 0.469 \text{Log}(\text{Acid}) + 0.415 \text{Log}(\text{Debt/Assets}) + \\ & + 0.496 \text{Log}(\text{Current/Total.Liab.}) - 0.425 \text{Log}(\text{Asset.Turn.}) - 0.485 \text{Log}(\text{Profit.Margin}) - \\ & - 0.164 \text{Log}(\text{Earnings}) - 0.413 \text{Log}(\text{Tax}) \end{aligned} \quad (5)$$

As all variables have been expressed in logarithmic form, the coefficients show the elasticity between the rate of tax evasion and the independent variable. In order to be able to predict the actual rate

$$\begin{aligned} \text{Tax Evasion \%} = & 30,761 \times (\text{Acid})^{0.469} \times (\text{Debt/Assets})^{0.415} \times (\text{Current/Total.Liab.})^{0.496} \times (\text{Asset.Turn.})^{-0.425} \times \\ & \times (\text{Profit.Margin})^{-0.485} \times (\text{Earnings})^{-0.164} \times (\text{Tax})^{-0.413} \end{aligned} \quad (6)$$

(Siegel, 1997). The estimated coefficients represent the elasticity of the rate of tax evasion with respect to the independent variables.

## 6.2. Regression analysis results

The regression analysis results are presented in Table 3. The sample was reduced from 116 to 110 observations due to missing values. The application of Kolmogorov-Smirnov test showed that the assumption of normality is not violated. All variables appear to be statistically significant. The regression equation is expressed as follows:

of tax evasion on the basis of the initial (non-logarithmic) values the model is expressed as follows:

**Table 3.** Results of OLS regression analysis of the financial variables on the extent of tax evasion

Panel A: Dependent variable is the tax evasion rate				Panel B: Dependent variable is the tax gap			
Variable	Coefficients	t-stat	Sig.	Variable	Coefficients	t-stat	Sig.
Constant	1.488	1.688	0.094	Constant	-3.938	-3.486	0.001
Log(Acid)	0.469	2.621	0.010***	Log(Acid)	0.599	2.919	0.004***
Log(Debt/Assets)	0.415	2.089	0.039**	Log(Debt/Assets)	0.473	2.059	0.042**
Log(Current/Total.Liab.)	0.496	2.166	0.033**	Log(Current/Total.Liab.)	0.809	3.003	0.003***
Log(Asset.Turn.)	-0.425	-3.092	0.003***	Log(Asset.Turn.)	0.317	2.278	0.025**
Log(Profit.Margin)	-0.485	-4.792	0.000***	Log(Profit.Margin)	0.134	1.493	0.139
Log(Earnings)	-0.164	-2.533	0.013**	Log(Assets)	0.870	11.234	0.000***
Log(Tax)	-0.413	-4.508	0.000***	Audit. Firm	-0.153	-2.112	0.037**
Adjusted R <sup>2</sup>	0.507			Adjusted R <sup>2</sup>	0.546		
F	16.983			F	19.701		
F-significance	0.000			F-significance	0.000		
N	110			N	110		

Panel A:  $\text{Log}(\text{Tax evasion rate}) = a + b_1 \text{Log}(\text{Acid}) + b_2 \text{Log}(\text{Debt/Assets}) + b_3 \text{Log}(\text{Current/Total.Liab.}) + b_4 \text{Log}(\text{Asset.Turn.}) + b_5 \text{Log}(\text{Profit.Margin}) + b_6 \text{Log}(\text{Earnings}) + b_7 \text{Log}(\text{Tax}) + \epsilon$ . The dependent variable is the tax evasion rate. Acid = (current assets - stocks)/current liabilities; Debt/Assets = total debt / total assets; Current/Total.Liab. = current liabilities / total liabilities; Asset.Turn. = sales / total assets; Profit.Margin = earnings before taxes / sales; Earnings = earnings before taxes; Tax = the amount of income tax paid divided by the accounting income

Panel B:  $\text{Log}(\text{Tax Gap}) = a + b_1 \text{Log}(\text{Acid}) + b_2 \text{Log}(\text{Debt/Assets}) + b_3 \text{Log}(\text{Current/Total.Liab.}) + b_4 \text{Log}(\text{Asset.Turn.}) + b_5 \text{Log}(\text{Profit.Margin}) + b_6 \text{Log}(\text{Assets}) + b_7 (\text{Audit.Firm}) + \epsilon$ . Acid = (current assets - stocks)/current liabilities; Debt/Assets = total debt / total assets; Current/Total.Liab. = current liabilities / total liabilities; Asset.Turn. = sales / total assets; Profit.Margin = earnings before taxes / sales; Assets = the amount of total assets; Audit.Firm = a dichotomous variable that takes the value of 1 if the audit firm is SOL S.A. and 0 otherwise

\* Significant at the 0.10 level

\*\* Significant at the 0.05 level

\*\*\* Significant at the 0.01 level

The regression results show a positive and statistically significant relation between liquidity (measured by the acid-test ratio) and the rate of tax evasion. At first glance, this finding is contrary to the conjecture that firms with liquidity problems may resort to tax evasion in order to finance their activities. However, this finding may be attributed to the increase in cash resulting from tax evading activities. This assumption is reinforced by the Pearson correlation between cash and tax gap which is estimated at 0.459 (significant at the 1% level). To provide further evidence, the acid-test ratio is replaced with the liquidity index and the model is rerun. For the sake of brevity, the results are not

reported here. The liquidity variable no longer appears to be significant whereas the coefficients of the other variables are not affected. It can be asserted that the liquidity of the firms that evade more taxes is higher due to the amount of cash they hold and not to other current assets. To sum up, the liquidity of a firm should not be considered to have a direct effect on the extent of tax evasion but to serve as a "red flag" in its prediction.

There is a positive and statistically significant relationship between the debt burden of a company (i.e. total debt to total assets ratio) and tax evasion. The coefficient of the ratio of current liabilities to total liabilities is also positive and statistically

significant, indicating that the maturity of the debt affects tax evasion. The coefficient for the asset turnover ratio is negative and statistically significant at the 1% level. Similarly, the coefficient for the net profit margin ratio is negative and statistically significant at the 1% level, indicating that firms that can quickly generate earnings from their operations do not resort to tax evasion. The coefficient for earnings, which serves as a proxy for firm size, is negative and statistically significant at the 5% level. The results are consistent with prior studies (Giles, 1998; Kourdoumpalou and Karagiorgos 2012) indicating that the rate of tax evasion is lower in larger companies. The coefficient of TAX is negative and statistically significant at the 1% level. This reveals that companies with higher tax evasion rates pay less money in taxes and consequently have higher liquidity. Similar to the analysis performed earlier regarding the acid-test ratio, the variable of the tax burden should not be considered to have a direct effect on the extent of tax evasion but to serve as a "red flag" in its prediction.

### 6.3. Testing model assumptions

A number of tests have been applied to test model assumptions. Specifically, normality has been verified by means of the Kolmogorov-Smirnov criterion. The scatterplot of the studentized deleted residuals against standardized deleted values (not presented here) showed no evidence of heteroskedasticity. The scatterplot also showed that the linearity assumption can be accepted. Heteroskedasticity was also examined by applying the Breusch-Pagan test, which showed that the null hypothesis of homoscedasticity could not be rejected. Last, multicollinearity was tested by computing the tolerance factor. According to Norusis (2006) there is not a problem of multicollinearity when the tolerance factor is greater than 0.10 whereas Garson (2008) sets the lower limit at 0.20. The lowest value in the study is 0.372 for the variable total debt to total assets (the results are not presented here) so it can be inferred that a problem of multicollinearity does not exist.

### 6.4. Model validation

The validity of the prediction model developed is examined by applying it on a control sample

$$\begin{aligned} \text{Log (Tax Gap)} = & a + b_1 \text{Log (Acid)} + b_2 \text{Log (Debt/Assets)} + b_3 \text{Log (Current/Total.Liab.)} + \\ & + b_4 \text{Log(Asset.Turn.)} + b_5 \text{Log(Profit.Margin)} + b_6 \text{Log(Assets)} + b_7 \text{(Audit.Firm)} + e \end{aligned} \quad (7)$$

The variables are defined below:

*Log (Tax Gap)* = The log (base 10) of the amount of tax gap;

*Log (Acid)* = The log (base 10) of the acid-test ratio {(current assets - stocks)/current liabilities};

*Log (Debt/Assets)* = The log (base 10) of the ratio of total debt / total assets;

*Log (Current/Total.Liab.)* = The log (base 10) of current liabilities / total liabilities;

*Log (Asset.Turn.)* = The log (base 10) of the asset turnover ratio (sales / total assets);

*Log (Profit.Margin)* = The log (base 10) of the net profit margin ratio (earnings before taxes / sales);

*Log (Assets)* = The log (base 10) of the amount of total assets;

obtained from the same population as the initial one. The whole sample consists of 116 public companies listed on ASE during 2000-2004 for which tax audit data were gathered for 305 firm-years in total. As the latest (most recent) audited year of each company formed the initial sample, the control sample consists of the previous year for which data is available. In this way, the control sample consists of 79 observations/companies, 37 of which refer to the accounting year 2003, 14 observations to 2002, 12 observations to 2001 and 16 observations to 2000. The mean actual rate of tax evasion is estimated at 16.84% while the mean predicted rate of tax evasion is estimated at 16.20%. The mean deviation of the predicted tax evasion rate from the actual one is 5.82%. The Spearman correlation coefficient between the actual and the predicted rate of tax evasion is estimated at 0.733 (significant at the 1% level).

## 7. PREDICTION OF TAX GAP ON THE BASIS OF FINANCIAL STATEMENT DATA

### 7.1. Variable definition and model development

In agreement with the methodology that was previously employed in order to build a prediction model for the rate of corporate tax evasion (section 6.1), we proceed to the examination of specific firm characteristics that relate to the extent of the tax gap. Seven variables are included in the regression model which examine the liquidity (acid-test ratio), the debt burden (total debt to total assets ratio and current liabilities to total liabilities ratio), the effectiveness (asset turnover ratio), the efficiency (net profit margin ratio), the size (total assets) and the audit firm. Again ordinary least squares regression analysis is applied, since all companies in the sample are tax evaders. Logarithmic transformation is also applied to all variables (except the audit firm). The log-transformation of the variables deals with problems of linearity, restores normality to skewed distributions and weakens scale effects (Siegel, 1997; Miralles and Veira; 2011). Willet (2015) also provides empirical evidence, mostly cross-sectional, that the distributions of the main accounting aggregates are all better approximated by a lognormal form when the data are positive. The following equation describes the regression model.

*Audit.Firm* = a dichotomous variable that takes the value of 1 if the audit firm is SOL S.A. and 0 otherwise.

### 7.2. Regression results

The regression analysis results are presented in table 3. The sample was reduced from 116 to 110 observations due to missing values. The application of Kolmogorov-Smirnov test showed that the assumption of normality is not violated. All variables appear to be statistically significant. The regression equation is expressed as follows:

$$\text{Log (Tax Gap)} = - 3.938 + 0.599 \text{ Log (Acid)} + 0.473 \text{ Log (Debt/Assets)} + 0.809 \text{ Log(Current/Total.Liab.)} + 0.317 \text{ Log (Asset.Turn.)} + 0.870 \text{ Log(Assets)} - 0.153 \text{ (Audit.Firm)} \quad (8)$$

As all variables (apart from audit firm) have been expressed in logarithmic form, the coefficients show the elasticity between the tax gap and the independent variable. In order to predict the actual

rate of tax gap on the basis of the initial (non-logarithmic) values, the model is expressed as follows when a company is not audited by SOL S.A.:

$$\text{Tax Gap} = 0.000115 \times (\text{Acid})^{0.599} \times (\text{Debt/Assets})^{0.473} \times (\text{Current/Total.Liab.})^{0.809} \times (\text{Asset.Turn})^{0.317} \times (\text{Assets})^{0.870} \quad (9)$$

When a company is audited by SOL S.A., the model is expressed as follows:

$$\text{Tax Gap} = 0.000115 \times (\text{Acid})^{0.599} \times (\text{Debt/Assets})^{0.473} \times (\text{Current/Total.Liab.})^{0.809} \times (\text{Asset.Turn})^{0.317} \times (\text{Assets})^{0.870} \times 1.422^{-1} \quad (10)$$

The regression results show a positive and statistically significant relation between liquidity (measured by the acid-test ratio) and tax gap. A similar positive relation was previously found between liquidity and the rate of tax evasion and was attributed to the excess of cash a company holds by avoiding taxes. The present finding is interpreted in the same way. This means that liquidity should not be considered to have a direct effect on the extent of tax gap but to serve as a “red flag” in its prediction.

There is a positive and statistically significant relationship between the ratio of total debt to total assets and tax gap as well as between the ratio of current liabilities to total liabilities and tax gap. The results suggest that companies choose to evade taxes in order to finance their debt and especially their short-term liabilities. The coefficient of the asset turnover ratio turns out to be positive and statistically significant whereas it was previously found (see section 6.2) to have a negative effect on the tax evasion rate. The results indicate that the more effective/profitable companies evade more taxes (in absolute numbers) but these taxes represent a smaller fraction of their actual tax burden (i.e. taxes that would have been paid if the companies had not evaded any taxes).

The variable of total assets has the highest impact on the tax gap, verifying that the largest companies tend to evade more taxes even though they have the lowest tax evasion rates. This finding suggests that the tax authority should focus on the sectors with the highest tax gaps and not on the ones with the highest tax evasion rates in order to maximize public revenue. The same findings hold if, as a sensitivity test, the company size is captured by the variables of sales, earnings or market value of equity with the coefficients of the other variables not being affected.

Auditing services were provided in Greece for the first time in 1955, through a public body of chartered accountants named S.O.L. At that time and until 1992 an audit report could also be issued for tax purposes. However, with the opening up of the market in 1992, the services provided by the auditors were fully separated from the tax audit of the companies. With the liberation of the audit market, S.O.L. was abolished and many of its former members founded the company (société anonyme) of Certified Public Accountants Auditors (S.O.L. S.A. - *Synergazomenoi Orkotoi Logistes A.E.*) which had the largest market share as its

accountants kept the costumers they had in the previous monopoly regime. S.O.L. S.A. is still the largest Greek auditing firm. The 57% of the companies in the sample has been audited by SOL S.A., 16% of the companies have been audited by a member of the Big-5 (or the Big-4, depending on the year), 24% have been audited by other Greek audit firms and the rest 8% have been audited by international companies (except for the Big-5). Consistent with previous studies (Kourdoumpalou and Karagiorgos, 2012), regression results show that the extent of tax evasion is significantly lower in the companies that have been audited by S.O.L. S.A. This finding has important implications regarding tax audits since, following Circular 1159/22.07.2011 of the Greek Ministry of Finance, the public companies are again obligated to have their tax returns attested by the statutory auditors.

The sole variable that did not turn out to be statistically significant is the net profit margin ratio. This finding can be explained considering that the amount of taxes that a firm can potentially evade depends mostly on its profitability rather than on its efficiency. To illustrate, two companies with earnings of €1.000 and €100.000 may evade up to “€1.000 x tax rate (%)” and “€100.000 x tax rate (%)” amount of taxes respectively, irrespective of their net profit margin ratio.

### 7.3. Testing model assumptions

A number of tests have been applied to test model assumptions. Specifically, normality has been verified by means of the Kolmogorov-Smirnov criterion. The scatterplot of the studentized deleted residuals against standardized deleted values (not presented here) was used to check for heteroskedasticity and linearity problems. Heteroskedasticity was also examined by applying the Breusch-Pagan test, which showed that the null hypothesis of homoscedasticity could not be rejected. Last, the tolerance factor was used to test for multicollinearity.

### 7.4. Model validation

The validity of the prediction model developed is examined by applying it on the control sample already determined in section 6.4. The actual tax gap of the control sample ranges from €14,245 to €3,449,000 with a coefficient of variation of 202%. The Spearman correlation coefficient between the



actual and the predicted tax gap is estimated at 0.827 (significant at the 1% level).

## 8. CONCLUSIONS

The main aim of the present paper is to examine the tax behaviour of the Greek public companies when they operated in an accounting environment characterized by a high level of book-tax conformity (one-book system). In accordance with international practice, the extent of tax evasion is captured by using two different measures: the rate of tax evasion (i.e. the ratio of the reported to true tax liability) and the tax gap (i.e. the difference between the taxes owed and the taxes actually paid). By relying on tax audit data, tax evasion is found to be widespread among public firms in a highly aligned book-tax system, complementing the study of Watrin et al. (2014) who report that high conformity between the single financial statement and the tax statement is associated with more downward earnings management. Moreover, taking into account that public companies in Greece are obligated to be frequently audited by the IRS, the study provides evidence that strict IRS monitoring does not deter corporate tax evasion.

The relative significance of different firm characteristics regarding the intensity of tax evasion is examined by means of OLS analysis. Companies with higher rates of tax evasion turn out to have higher liquidity, more debt (especially short-term liabilities), are less effective and efficient in generating earnings and are smaller in size. Companies with higher amounts of tax gap are larger in size, have more liquidity, more debt (especially short-term liabilities) and are more effective. Furthermore, tax gap is found to be significantly lower in the companies audited by S.O.L. S.A., which is the largest Greek audit firm. The validity of the prediction models developed was tested by applying them on a control sample. Both the prediction of the rate of tax evasion and of the tax gap are considered satisfactory.

The outcomes of the present study may assist public bodies, such as tax authorities and regulatory bodies, as well as audit firms<sup>3</sup>, in detecting and deterring tax evasion. After the adoption of IFRS in 2005, public companies in Greece publish their financial statements in accordance with IFRS whereas they apply Greek GAAP for tax purposes. The prediction models developed in the present paper are hence applicable for the years after the adoption of IFRS. However, the accounting data of the public companies generated in accordance to the Greek GAAP is disclosed only to the tax authorities and the audit firms and are not publicly available. Nowadays, an increasing number of countries have switched from a tax-based accounting system to a book-tax independent system with the transition to IFRS. Some researchers (Desai, 2005; Whitaker, 2005) assert that the separation of tax and accounting income triggers aggressive financial reporting as no tax costs are incurred, while others (Hanlon et al., 2008; Atwood et al., 2012) claim that the informativeness of earnings is enhanced. The present study contributes to the book-tax

conformity debate by providing evidence that tax goals prevail over financial reporting in a one-book system. By focusing on Greece the paper responds to recent calls for more evidence from Europe (Watrin et al., 2014). However, taking into account the small size of the sample and the distinctive features of the Greek accounting setting, as for example the high ownership concentration in public companies (Tsalavoutas and Evans, 2010), any generalization of the results should be made with caution. Future research, examining tax and financial reporting behaviour of the Greek public companies after the adoption of IFRS will provide insight into the impact of IFRS adoption on managerial reporting incentives and accounting quality.

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<sup>3</sup> Following Circular 1159/22.07.2011 of the Greek Ministry of Finance, public companies in Greece are obligated to have their tax returns attested by the statutory auditors.

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