

# **The Influence of Tax Composition on Tax Evasion**

By

Anastasiia Ivlieva

MPP Essay

Submitted to

Oregon State University

In partial fulfillment of  
the requirements for the  
degree of

Master of Public Policy

Presented June 9<sup>th</sup>, 2015

Graduation June 15<sup>th</sup>, 2015

Master of Public Policy Essay of Anastasiia Ivlieva presented on June 9<sup>th</sup>, 2015

**APPROVED**

---

Dr. Elizabeth Schroeder, representing Economics

---

Dr. Alison Johnston, representing Political Science

---

Dr. Brent S. Steel, representing Political Science

I understand that my thesis will become part of the permanent scholar collection of Oregon State University Libraries. My signature below authorizes release of my thesis to any reader upon request.

---

Anastasiia Ivlieva, Author

## Abstract

Tax evasion is one of many problematic issues associated with tax systems that negatively affect state's ability to provide public goods and services. This study seeks to examine the impact of tax composition on tax evasion using information about 150 countries from 1999 to 2007. The paper adopts neoclassical theoretical framework based on the assumption that individuals maximize their utility function by making rational decisions regarding tax compliance while accounting for external factors. The results were obtained by performing fixed-effects regressions in which the main dependent variable, tax evasion, was approximated by the size of the shadow economy. The findings suggest that an increase in the ratio of income taxes to consumption taxes is expected to increase tax evasion in the group of OECD countries, which partially supports the main hypothesis and fully supports the hypothesis about differences in the influence of tax composition on tax compliance in highly developed and developing nations. Moreover, an increase in the ability of country's citizens to participate in selecting their government as well as in freedom of speech and expression is associated with declining tax evasion. These results are discussed in the work together with policy implications based on the findings.

## TABLE OF CONTENTS

1. INTRODUCTION.....	5
2. BACKGROUND AND THEORETICAL FRAMEWORK .....	8
3. REVIEW OF EMPIRICAL LITERATURE .....	14
4. DATA AND METHODS.....	21
5. EMPIRICAL RESULTS .....	28
6. DISCUSSION AND POLICY IMPLICATIONS.....	33
7. CONCLUSIONS AND LIMITATIONS.....	36
REFERENCES.....	38
APPENDICES.....	42

## 1. INTRODUCTION

It is difficult to argue with the statement that a tax system is an essential element of the public sector. Tax evasion is one of many problematic issues associated with tax systems that negatively affect government's ability to raise sufficient amounts of money to finance public projects. Therefore, it is important to understand how different factors influence this phenomenon in order to be able to design tax structures that minimize incentives and possibilities to evade taxes.

Over the past few decades, theoretical and empirical issues related to tax evasion have been studied by researchers from different fields. Scholars have developed economic models that explain an individual's decision to evade taxes from a rational standpoint (Allingham and Sandmo 1972; Yitzhaki 1974); others added social and moral issues to the list of influential factors (Erard and Feinstein 1994; Spicer and Becker 1980). A wide range of determinants of tax evasion has been identified. Academics agree that the choice of tax composition is an important policy instrument in the public finance sector (Atkinson and Stiglitz 1976; Cremer, Pestieau, and Rochet 2001). Specifically, the design of tax structures could determine their efficiency in the presence of tax evasion (Boadway, Marchand, and Pestieau 1994; Boadway and Richter 2005). Therefore, one of the questions that scholars and policy makers argue about is whether certain types of taxes are more efficient than others. Changing tax composition in a way that allows to reduce tax evasion could be beneficial in terms of raising adequate amounts of tax revenues. This work seeks to assess the influences of tax structure on tax evasion from a cross-country perspective.

Empirical studies on tax evasion have primarily focused on such issues as measuring the degree of noncompliance (Bergman 2003; Feinstein 1991; Vogel 1974) or studying the influence

of different factors on evasion including income amount, tax rates, penalty rates, probability of detection, and demographic characteristics or social perceptions of taxpayers (Cebula 2013; Clotfelter 1983; Mason and Calvin 1978; Pommerehne and Weck-Hannemann 1996). The authors of these articles usually examine tax evasion in one particular country. However, more recent papers have attempted to compare the differences in tax systems across countries. For example, some scholars investigate the influence of tax composition on various macroeconomic indicators such as economic growth, corruption, inequality, macroeconomic stability, etc. (Acosta-Ormaechea and Yoo 2012; Lee and Gordon 2005; Liu and Feng 2014). Nevertheless, the literature examining the connection between tax evasion and tax structure across different countries is scarce (one of the examples is a paper by Martinez-Vazquez and Vulovic (2011) that focuses on Latin American countries). Thus, this work contributes to the literature by studying the impact of tax structure on tax evasion in a large sample of countries and evaluating the differences in this impact between highly developed and developing countries.

To answer the research question about the effect of tax composition on tax compliance, an empirical model was developed. The main dependent variable, tax evasion, is approximated by the size of the shadow economy as a percentage of GDP as previous papers have adopted (Martinez-Vazquez and Vulovic 2011) and many researchers have mentioned close relation of these two concepts (Schneider and Buehn 2013; Tanzi and Shome 1993). Moreover, it allows to study the impact of different types of taxes on tax evasion simultaneously. The main independent variable, tax composition, is measured through the ratio of revenues from income taxes to revenues from consumption taxes. The model also tests the influence of a number of economic and political variables. The dataset was constructed using calculations of the size of shadow economies from the paper by Schneider, Buehn, and Montenegro (2010); World Development

Indicators computed by the World Bank that contain information on tax composition in different countries, GDP per capita, unemployment rate, and government consumption expenditures; Worldwide Governance Indicators that include different measures of government performance; and the OECD statistical database. The paper presents the results obtained using a country-fixed linear panel regression with clustered robust standard errors.

The findings partially confirm hypotheses tested in this work. First, an increase in tax ratio (i.e., greater reliance on income taxes) has a positive impact on tax evasion only in OECD member countries. Non-OECD countries experience the opposite effect of tax composition on tax evasion: increasing tax ratio leads to decreasing tax evasion. Thus, another hypothesis of differential influence of tax structure on tax compliance in highly developed and developing nations is supported. Finally, the only political measure of government performance that appears to be significant is a Voice and Accountability indicator that measures the degree to which citizens of a country can participate in selecting their government and freedom of speech and expression. Strong government performance in this area is expected to decrease tax evasion.

The rest of the paper is organized as follows. The next section describes the theoretical background and framework used to explain tax evasion. The third section summarizes the main findings of previous empirical studies of the topic. The fourth section presents an empirical model and defines the variables included in this model. Section five describes the main results of this study. The following section discusses these results as well as their policy implications. The last section outlines research limitations and conclusions drawn from the findings.

## 2. BACKGROUND AND THEORETICAL FRAMEWORK

There are many critical aspects that have to be taken into account when considering government functions and its overall performance. One of these aspects is government's ability to finance its projects in relation to the provision of public services and to ensure equal distribution of national resources in a given society. The most common and effective method used to perform the aforementioned tasks is fund raising through tax collections. Therefore, those activities of businesses and individuals that prevent government authorities from obtaining sufficient amounts of monetary funds make a significant contribution to inability of public officials to finance different social programs such as education, health care, public transportation, etc. (Pommerehne, Hart, and Frey 1994).

One of the most noticeable issues that has been studied in detail over the past few decades is tax evasion. Tax evasion is usually defined as nonpayment of taxes that is considered illegal under a tax system (Gruber 2010). Tax evasion is different from tax avoidance, which occurs when individuals and businesses try to reduce their tax liabilities using legal means (e.g. through tax shelters). Although sometimes it is difficult to differentiate between these two types of activities, this paper is concerned with the illegal aspect of nonpayments that is tax evasion.

There are a few theoretical approaches to the issue of tax evasion. The standard economic theory assumes that taxpayers base their decisions about tax payments on rational calculations. Therefore, the optimal amount of tax evasion occurs when the benefits of evading taxes (taxes that individuals did not pay) equal the costs of such activities (probability and severity of punishment) (Gruber 2010). The most famous theoretical approach that is closely related to this rational framework was initiated in the classic paper by Allingham and Sandmo (1972). The authors present a simple formal model of compliance decision making. They assume that the

taxpayer is trying to maximize his or her expected utility by deciding how much income to declare (actual income or less than actual income). This individual has to pay taxes on declared income that is levied at a constant rate. This decision is made under uncertainty since there is some probability of investigation by the government authorities that will result in disclosure of the actual amount of taxpayer's income. In this case the taxpayer will pay a penalty at a certain rate on the undeclared income. The scholars then study how different parameters of their model such as actual income, tax rate, penalty rate, and probability of detection influence tax compliance decisions that are represented by the amount of declared income. They conclude that the probability of detection and the penalty rate are negatively related to tax evasion. Thus, an increase in the penalties associated with tax evasion as well as the number of audits will lead to a larger amount of declared income (Tanzi and Shome 1993). However, the relationship between actual income or tax rate and declared income is not very clear. The influence of the first variable depends on relative risk aversion, which may increase, stay constant or decrease when actual income changes, and the influence of the second variable depends on income and substitution effects that have opposite signs. The further developments of this model incorporate dynamic aspects of declaration decisions of individuals.

There are other extensions of this model that incorporate labor supply or make different assumptions regarding the penalty rate. For example, Yitzhaki (1974) points out that if the penalty rate is imposed on the amount of evaded tax payments rather than the undeclared income then there is no substitution effect. Therefore, if absolute risk aversion decreases with income then a higher tax rate will actually decrease the income evaded (Slemrod 2007).

Another theoretical approach to the issue of tax evasion introduces an idea of changing probability of detection. These models assume that the probability of investigation is determined

as a part of an equilibrium and depends on reported income. In the first period of the tax collection process all individuals report their incomes. In the second period administrative authorities conduct a number of audits. Different types of these models assume that the tax authority announces its "audit rule" either before the reports are made or chooses the subjects of investigation after the end of the first period. Therefore, the amount of tax evasion is determined within these equilibrium frameworks that could be divided into two groups: principal-agent problem models and game-theoretic concepts of equilibrium (Andreoni, Erard, and Feinstein 1998).

The majority of the models based on the assumptions of the first approach mentioned in this paper predict lower compliance rates and higher tax evasion than are observed empirically. Therefore, another theoretical framework incorporates a number of certain moral and social factors that may also determine tax compliance. Andreoni, Erard, and Feinstein (1998) discuss three groups of such factors: moral rules and sentiments, fairness of the tax code or its enforcement, and taxpayer's general perception of the government (the degree of satisfaction with the provision of public services, perceptions of corruption level, etc.). For example, Erard and Feinstein (1994) include guilt and shame as well as taxpayers' subjective perceptions of the probability of audit in the model of tax compliance. They test their model empirically and find that if the perception parameters are constrained to realistic values, then guilt and shame play an important role in explaining compliance behavior. Spicer and Becker (1980) conduct an experiment to assess how individuals' perceptions of fiscal inequity influence their evasion decisions. The authors conclude that tax evasion was high if participants were told they had to pay higher taxes than others but it was low if they were told they had to pay lower taxes than others. Pommerehne, Hart, and Frey (1994) develop a simulation model that allows to evaluate

the connection between tax evasion and policy instruments such as public audit intensity and fines on tax evasion in direct and representative democracies. Taking into account government public good provision, they find that private commitment to tax laws as well as fines on tax evasion are higher in direct democracies whereas the intensity of public audits is higher in representative democracies. Overall, incorporating social and moral aspects of compliance decision making is important for explaining tax evasion. However, concerns about the most appropriate way of including these variables in a theoretical and empirical analysis still exist.

Taking into consideration all of the above mentioned approaches to tax evasion, this work adopts a neoclassical theoretical framework based on the assumption that individuals maximize their utility function by making decisions regarding tax compliance while accounting for external factors such as tax rates, probability of audit, penalty rate, etc. Moreover, aside from the factors that have already been discussed above, one of the important variables that influences taxpayers' payment decisions is tax structure.

The issue of the optimal tax structure design has received substantial attention among economic and political scholars. It is commonly believed that a tax policy should comply with certain principles in order to function effectively. These criteria usually include principles of adequacy, horizontal and vertical equity, and efficiency (neutrality). Clearly, tax evasion violates the principle of adequacy since it prevents governments from raising adequate amounts of money; horizontal equity since it creates different conditions for those individuals who evade and those who don't evade; and so on. In addition, principles of simplicity and compliance as well as accountability are also important (Brunori 2011). Therefore, the theoretical and empirical literature on optimal taxation describes different tax compositions that in academics' views comply with the principles in the best possible way. In their paper, Atkinson and Stiglitz (1976)

consider the choice faced by the government regarding different kinds of taxation. They develop a model that helps to evaluate the consequences of adoption of direct and indirect types of taxes for efficiency and equity objectives of government agents. Assuming that preferences are separable between labor supply and produced goods, the authors conclude that the optimal tax structure could be achieved by employment of nonlinear income taxation alone; hence, incorporation of indirect taxation is not necessary.

Cremer, Pestieau, and Rochet (2001) follow the same definition of direct and indirect taxes as the previously mentioned authors. This definition is based on the information criterion: since direct taxes such as income tax are levied on individuals directly, it is possible to adjust these taxes in order to account for taxpayer's individual features, whereas indirect taxes such as consumption tax are levied on transactions and, thus, are proportional regardless of taxpayer's characteristics. Incorporating an assumption that individuals are different not only in terms of their earning ability but also in terms of endowments in their model, Cremer et al. (2001) reach completely opposite conclusions. They point out that commodity taxation plays an important role in the process of designing optimal tax policy. Therefore, different models of optimal tax structure are heavily influenced by key assumptions that economic researchers make.

The idea that tax evasion could alter the design of optimal tax structure is also presented in economic literature. Cremer and Gahvari (1994) incorporate tax evasion in their model of optimal income taxation. They show that when taxpayers are allowed to influence the probability of detection by changing their concealment expenses, then, depending on whether this probability is affected by the proportion of income concealed or its actual amount, tax evasion makes a tax system less or more progressive respectively. Their conclusions regarding optimal

tax rates and audit probability are also dependent on different assumptions as the authors describe conditions under which tax evasion could increase or lower the optimal tax rate.

Boadway and Richter (2005) and Boadway, Marchand, and Pestieau (1994) include tax evasion in their models that attempt to describe how tax evasion could affect government's decisions regarding optimal tax composition. The first paper analyses how narrow-based consumption tax that is difficult to evade can improve tax structure efficiency when there is a broad-based income tax that is easy to evade. The authors come to the conclusion that the consumption tax lowers private costs of risk-taking that are created by income tax evasion while increasing social costs associated with the distortion that arises because of reduced opportunities for tax evasion (Boadway and Richter 2005). Similarly, Boadway et al. (1994) assume that only income taxes can be evaded. They also find that in the presence of tax evasion it is beneficial to supplement direct taxation with indirect tax as opposed to the situation when there is no tax evasion. In the latter case nonlinear income tax would suffice. Although the above described studies expect income taxes to be more prone to evasion than consumption taxes, Watrin and Ullmann (2008) find in the experimental setting that the median compliance is higher for the income tax than for the consumption tax. They study the impact of framing on tax evasion and conclude that the consumption tax causes more evasion; also, individual's reaction is stronger towards a change in the probability of detection in the case of indirect taxation.

To summarize, there are many different aspects of tax evasion that need to be considered by theoreticians and practitioners who try to address this issue. This paper attempts to study the influence of a tax structure on tax evasion. The most general conclusion that could be drawn from the surveyed theoretical literature is that direct taxation most commonly represented by income taxes is more problematic in terms of tax evasion than indirect taxation, which is usually

implemented through different types of commodity taxes. The intuition here is very straightforward: the consumption tax should not create any incentives for firms to underreport taxes if they do not affect input purchases (Murray 1997). Certainly, there are other valid arguments that could be made against this claim. For example, one may point out that those companies that want to gain comparative advantages by lowering market prices of their goods may engage in tax evasion. Therefore, the primary objective of this work is to find some empirical evidence of the different influence of direct and indirect types of taxes on tax evasion.

### 3. REVIEW OF EMPIRICAL LITERATURE

The most essential theoretical issues concerning tax evasion were outlined in the previous section; this part of the work examines the variety of research topics in the growing body of empirical literature. To start with, there are a lot of papers that analyze the problem of tax evasion in a particular country (Bergman 2003; Ogbonna 1975; Pommerehne and Weck-Hannemann 1996; Slemrod 1985). These publications range from more descriptive types of studies (Ogbonna 1975) and comparative case studies of different countries (Bergman 2003) to those that assess the influence of different government instruments and individual characteristics on tax evasion (Pommerehne and Weck-Hannemann 1996; Slemrod 1985). The works evaluate the extent and nature of tax evasion in both developed and developing countries.

However, before one can examine tax evasion in a real-world setting in detail, it would be useful to grasp the actual amount of evaded taxes in a given social system. The difficulties associated with this objective are related to the hidden nature of tax evasion and prompted the development of one of the most common themes that could be identified in the literature. There are a few possible ways to estimate the value of underpaid taxes. Andreoni et al. (1998) mention five types of data sources used by different scholars: audit data which is matched with census

data in some cases, survey data, tax amnesty data, data generated through laboratory experiments, and measurements of discrepancies in economic statistics. This classification is quite similar to the methods of estimating the size of tax evasion described by Tanzi and Shome (1993) who include the use of national accounts, direct controls (tax compliance sampling method), household budget and direct taxpayer surveys in the group of direct methods and various approaches to estimation of the size of underground economy in the group of indirect methods. The latter group is chosen for the analysis in this paper due to the fact that cross-country data on the size of shadow economies is relatively readily available for a large number of countries. The next section presents supportive arguments for this way of measuring tax evasion.

The use of direct audits of taxpayer reports is probably one of the most reliable and accurate sources of information regarding tax evasion. For example, the National Research Program implemented by the U.S. Internal Revenue Service that replaced the Taxpayer Compliance Measurement Program (Slemrod 2007) provides estimates of the tax gap (how much tax should be paid and how much is actually paid) that are based on the results of research audits of selected number of returns. The researchers then use this information to study the determinants of tax evasion (Cebula 2013; Clotfelter 1983; Feinstein 1991; Slemrod 1985). Unfortunately, the agency calculates these figures only for the U.S. tax system.

Another source of data on tax evasion is the use of different types of surveys. Vogel (1974) analyzes a taxpayer survey conducted in Sweden to evaluate public perceptions and attitudes towards the tax collection system in general and tax evasion in particular. The survey attempted to measure the degree of tax evasion by asking questions about respondent's reporting behavior. Mason and Calvin (1978) conduct another study of admitted tax evasion in Oregon. Using a sample survey of adult population they find that almost one in four individuals admitted

they had tax evasion experience. However, this method of assessing tax evasion has received a number of comments. It is widely believed that the figures based on survey data underestimate the actual amount of evaded taxes significantly even when the surveys guarantee anonymity to the respondents (Andreoni et al. 1998; Tanzi and Shome 1993).

The extent of tax evasion could also be assessed by conducting experiments. Spicer and Becker (1980) and Watrin and Ullmann (2008) recruited student subjects as research participants for their tax games to study how their perceptions regarding fiscal inequity or the framing of the taxes influence their compliance decisions. Certainly, one could argue about generalizability of the results of such laboratory experiments. Nevertheless, given the subjective nature of these authors' research questions experimental approach might be the best possible way to test their hypotheses. Slemrod, Blumenthal, and Christian (2001) examine tax compliance decisions based on a field experiment in Minnesota. They use difference-in-differences methodology to evaluate how subjects in the treatment group that received letters promising close examination of their tax returns changed their reporting behavior. They find that low- and middle-income taxpayers in the treatment group reported more compared to the previous year and to taxpayers in the control group. However, high-income taxpayers who possibly thought of the letters as of the start of negotiations and treated reported income as the low opening bid, reported less taxable income. Thus, the information obtained through laboratory and field experiments is valuable for understanding behavior components of compliance decisions of individuals.

The last approach to measuring tax evasion discussed here is based on the measurements of discrepancies in national accounts (Bergman 2003; Christie and Holzner 2006; Pommerehne and Weck-Hannemann 1996). The method follows the logic that national accounts provide information about the base that is supposed to be taxed and could be compared with the base

actually reported to the tax authorities. These studies usually develop their own methodologies in order to account for difficulties related to such calculations and produce separate estimates for evaded income and consumption taxes. Moreover, given the amount of work associated with producing these estimates the researchers usually focus on one country or on a small subset of countries. For example, Pommerehne and Weck-Hannemann (1996) estimate household income gap in Switzerland; Bergman (2003) examines different measures of compliance in the case of Value Added Taxes in Chile and Argentina; Christie and Holzner (2006) calculate separate measures of compliance rates for selected European countries. Unfortunately, due to differences in research methodologies, it is difficult to make cross-study comparisons of the extent of tax evasion in the countries of interest.

In addition to calculations of the amount of evaded taxes, the majority of authors that conduct empirical studies seek to test different predictions that emerge from the theoretical modeling of tax evasion. They study the influence of different determinants on tax compliance behavior. The results of these studies suggest that some factors have very complex effects on taxpayer decisions since some of the researchers find positive and some find negative correlation between the factors and tax evasion and magnitudes appear to be even harder to predict. The most investigated determinants of tax evasion could be divided into four groups.

The first group of influential factors includes income amount and tax rates. The theory of tax evasion does not provide clear hypotheses about the direction in which these variables affect tax compliance. The predictions depend on how taxpayer's risk aversion changes with income in the case of income variable and income and substitution effects in the case of tax rates. Therefore, it is not surprising that empirical results are mixed. Clotfelter (1983) and Pommerehne and Weck-Hannemann (1996) conclude that higher income is associated with

greater tax evasion. However, the survey study conducted by Mason and Calvin (1978) provides evidence that income is negatively associated with tax evasion. Moreover, Spicer and Becker (1980) and Feinstein (1991) (in his pooled model) don't find any significant effect of income on tax compliance. The marginal tax rate is usually predicted to positively affect tax evasion (Cebula 2013; Christie and Holzner 2006; Clotfelter 1983; Pommerehne and Weck-Hannemann 1996). However, Feinstein (1991) finds negative association between the marginal tax rate and tax evasion. His conclusions are interesting in terms of separating the effects of income and tax rates that are highly correlated. The author estimates two models for 1982 and 1985 data and then constructs the pooled model for these years. The influence of income is positive and significant in the separate models for two different years but insignificant in the pooled model, as mentioned above. The marginal tax rate is also positive and significant in the separate models but it becomes negative although still significant in the pooled model. The researcher favors the conclusions of the pooled model since it incorporates the fact that taxpayers with the same income levels face different tax schedules in different years. Thus, Feinstein (1991) concludes that income has no effect while the tax rate has a negative effect on tax evasion. Although the coefficients in his model are not significant, Slemrod (1985) also points out that the marginal tax rate has a negative impact on tax evasion when income (which is positively related to evasion) is included in the regression.

The second group of factors is related to the deterrence instruments of tax policy. The influence of the probability of detection and penalty rates appears to be clear and mostly follows theoretical predictions. The probability of detection is negatively associated with tax evasion (Cebula 2013; Mason and Calvin 1978; Pommerehne and Weck-Hannemann 1996; Slemrod et al. 2001). The impact of the penalty rate is less certain since some studies don't find any

significant correlation with tax compliance (Mason and Calvin 1978; Pommerehne and Weck-Hannemann 1996); however, in general, the severity of punishment negatively affects illegal behavior (Cebula 2013).

The third group of determinants includes social and demographic characteristics of taxpayers. Overall, tax evasion is predicted to be lower for older people (Feinstein 1991; Mason and Calvin 1978; Pommerehne and Weck-Hannemann 1996; Slemrod 1985) and higher for married individuals (Feinstein 1991; Slemrod 1985). Some experimental studies also suggest that males are more likely to evade compared to females (Mason and Calvin 1978; Spicer and Becker 1980). Clearly, taxpayers with different opportunities to evade will have different compliance behavior (Mason and Calvin 1978). Therefore, those individuals who have non-wage income are more likely to conceal it than those whose income is taxes at source (Pommerehne and Weck-Hannemann 1996).

The last group of the factors that influence tax behavior could be framed as public attitudes and social perceptions of taxpayers regarding institutional environment in a given society. While Mason and Calvin (1978) don't find any significant effect of equity perceptions on tax compliance, Spicer and Becker (1980) come to the opposite conclusion that fiscal equity is an important determinant of the decision to evade. Cebula (2013) includes public's dissatisfaction with government in his model and finds that higher degree of dissatisfaction leads to more evasion. Christie and Holzner (2006) point out that higher income inequality negatively influences compliance behavior in the case of income taxes, excise taxes and social security contributions. Overall, it is difficult to draw certain conclusions for this group of factors since there is no consistency among the variables that different researchers include in their models. Even though it is hard to make an exhaustive list of determinants that describe institutional

perceptions of taxpayers, this work incorporates some of the variables that may help to assess how attitudes towards government influence tax evasion. The overall quality of government institutions is closely related to taxpayers' perceptions regarding government performance. Thus, the variables that measure government's strength such as the degree of citizens' participation in selecting their government, freedom of expression, government's ability to provide public goods and services, and control of corruption could help to evaluate the factors that influence compliance behavior of taxpayers in this group of determinants. The next section describes included variables in more detail.

Although the idea that tax composition is one of the factors that may potentially influence tax evasion appears to be fairly intuitive, it is not represented well in empirical literature. There are a number of studies that examine the influence of tax structure on different macroeconomic indicators other than tax evasion. One of the most investigated dependent variables is economic growth. Depending on the use of different datasets, samples, and methodological techniques, researchers have obtained conflicting results. Some scholars mention that favoring income taxes (Acosta-Ormaechea and Yoo 2012), labor taxes (Arachi, Bucci, and Casarico 2015), corporate taxes (Lee and Gordon 2005) or direct taxes in general (Martinez-Vazquez and Vulovic 2011) over other types of taxes is associated with lower economic growth while a shift towards consumption taxes is associated with higher economic growth (Acosta-Ormaechea and Yoo 2012; Arachi et al. 2015). However, other empirical studies do not find support for shifting preferences from corporate income taxes to personal income taxes, or from personal income taxes to consumption taxes (Xing 2011). Other examples of examined relationships include influences of tax composition on corruption (Liu and Feng 2014), inequality, macro-economic stability, foreign direct investment (Martinez-Vazquez and Vulovic 2011), etc.

Since the idea of the link between economic development and tax composition appears to be very popular in the empirical literature, it is important to account for this link in the study of tax evasion. Therefore, GDP per capita, the unemployment rate, and government consumption expenditures are included in the model. Moreover, this study also investigated the differences in the influence of tax structure on tax evasion between highly developed and developing countries.

This paper contributes to the literature by investigating the relationship between tax composition and tax evasion using country-level data for a sample of 150 countries from 1999 to 2007. The next section describes model specification as well as data sources used to obtain information on tax structures and evasion in different countries and discusses the issues with measuring dependent and independent variables.

#### 4. DATA AND METHODS

##### Empirical model

The main research question of this paper is concerned with the influence of tax structures on tax evasion. To examine this relationship, the following hypotheses are tested based on the theoretical and empirical studies presented above:

*Hypothesis 1. The increase in income taxation relative to consumption taxation increases tax evasion.*

An income tax is assumed to be more prone to tax evasion since individuals exercise direct control over their reports of the amount of taxable income. Their benefits in this case equal the amount of evaded taxes. However, taxes on goods and services are imposed on transactions; therefore, consumers pay these taxes to public authorities indirectly through tax collections by companies that produce goods and provide services. Thus, consumption taxes should be more

difficult to evade than income taxes. Consequently, countries that rely on income taxes more than on consumption taxes should experience higher tax evasion.

*Hypothesis 2. The quality of government institutions plays a significant role in the ability of public authorities to control tax evasion.*

The extent of tax evasion does not only depend on the instruments that are explicitly managed by the state, such as tax mix, tax rates, penalty rates, and so on. The degree of compliance is also likely to be sensitive to the overall quality of government institutions. Institutional quality could be captured by measures such as the prevalence of corruption in societies, the ability of governments to ensure public goods provision, or the ability of citizens to participate in political processes. A set of political variables, discussed below, were added to the model to study the effect of government institutions.

*Hypothesis 3. The influence of tax structure on tax evasion is different in developed and developing countries.*

The relationship between the composition of taxes and tax compliance may differ significantly depending on the level of a country's development. There are many economic, political, and social conditions that could interact with the influence of tax structure on evasion. For example, if tax morale, which can be defined as a moral belief in making a social contribution by paying taxes (Torgler and Schneider 2009), is higher or policy enforcement is better in developed countries than in developing societies, those governments could have more flexibility in terms of tax structure design, as citizens would comply with tax regulations regardless of which type of tax they needed to pay. Thus, tax composition could matter more in developing countries. To test this hypothesis, a dummy variable for OECD countries is included in the model and interacted with the measure of tax composition.

The member states of the Organization for Economic Cooperation and Development (OECD) are usually considered to be the most developed nations not only in terms of their economic performance indicators but also their institutional environments. It is important to keep in mind, however, that there is a difference in the level of development even between these countries (e.g., Mexico, Greece and the U.S.). Nevertheless, this categorization still allows to identify the level of countries' development due to its international recognition. Moreover, independent variables included in the model control for important differences between OECD countries.

The primary equation estimated in this paper could be presented in the following form:

$$TE_{it} = \beta_0 + \beta_1 TR_{it} + \beta'_2 X_{it} + \beta'_3 Z_{it} + \alpha_i + \delta_t + \varepsilon_{it}; \quad i = 1 \dots n, t = 1 \dots T$$

where  $i$  is an index for country and  $t$  indicates year. The dependent variable,  $TE$ , is tax evasion; as discussed in detail below, tax evasion is measured by the size of the shadow economy as a percentage of GDP. Selection of the explanatory variables and related measurement issues are also discussed below. The main explanatory variable of interest is the tax ratio,  $TR$ , which measures the extent to which revenue received from income taxes is greater than revenue received from consumption taxes.  $X_{it}$  is a vector that includes economic variables such as GDP per capita, the unemployment rate, and government final consumption expenditure.  $Z_{it}$  is a vector of political variables that includes different Worldwide Governance Indicators constructed by the World Bank researchers and measures the performance of government institutions.  $\alpha_i$  denotes country-level fixed effects;  $\delta_t$  is a linear time trend; and  $\varepsilon_{it}$  is an error term. The exact definitions of the variables as well as relevant data sources are presented in Appendix A.

The issue that one may be worried about while examining the link between tax composition and tax evasion is the reverse causality argument, i.e., tax ratio is changing in response to tax evasion. It seems unlikely that governments change their tax policies because of the extent of tax evasion in a society due to two reasons. First, tax evasion is an unobserved phenomenon; thus, it would be difficult for public authorities to change the structure of taxes in response to tax evasion simply because the exact figures of evaded taxes are unknown. Second, there are a lot of issues that influence state's decision making when governments consider tax reform such as equity concerns or political games. Therefore, government authorities may prefer satisfying other public demands when considering changes in tax structure before they attempt to resolve tax evasion issues.

However, it is still possible that the amount of tax revenue is affected by the ability of tax administrations to actually collect taxes. While this tax collection capacity is unlikely to influence tax composition in developed countries due to their high capability to enforce legal regulations, it may impact tax structure in developing states. The ratio of tax revenues from different types of taxes could change in developing countries because tax collections change in response to increasing state capacity. The process of development is associated with improving ability of government authorities to collect taxes via better recording or monitoring of income. Therefore, with increased state capacity, the amount of tax revenues from income taxes increases, even if the legal structure of taxes does not change. Since measuring state capacity directly is quite difficult, this study accounts for its influence by including political and economic variables discussed below to control for the overall quality of government institutions and for the level of development. This work implicitly addresses the issue of the importance of tax collection capacity in developing countries compared to developed states by investigating the

differences in the influence of tax composition on tax evasion between high-income OECD members and non-OECD states.

#### Data and measurement: Tax evasion

As discussed above, one of the challenges with regard to studying tax evasion is determining a numerical value for the amount of evaded taxes. In order to evaluate the influence of tax structure on compliance behavior, this paper uses the size of the shadow economy, as a percentage of GDP, as a proxy for tax evasion. Although the literature examining the link between tax evasion and tax composition is scarce, the use of the shadow economy as a measure of noncompliance has been adopted by a few papers. For example, Martinez-Vazquez and Vulovic (2011) are interested in investigating the relationship between tax structure and tax compliance. The authors use the shadow economy and tax morale as their dependent variables in order to study the connection between tax evasion and the structure of taxes. However, their primary focus is Latin American countries.

A weakness of this approach is that the informal economy includes other factors in addition to underpaid taxes. Even an approximate measure of noncompliance, however, can help answer the question of what determines tax evasion, for two reasons. First, while the underground economy and tax evasion are not identical (Sam 2010), they are closely related. Schneider and Buehn (2013) state that the shadow economy includes “all market-based legal production of goods and services that are deliberately concealed from public authorities” in order to avoid payments of taxes or social security contributions and certain legal and administrative regulations (e.g., labor laws, quality standards, etc.) (p. 3). Boadway and Richter (2005) note that the size of the shadow economy could be used as an approximate measure of the proportion of

hidden income. Moreover, as mentioned above, Tanzi and Shome (1993) suggest using estimates of the size of the underground economy as indirect measures of tax evasion.

Second, researchers often measure tax evasion in the case of income taxes or consumption taxes separately (Bergman 2003; Christie and Holzner 2006; Feinstein 1991; Pommerehne and Weck-Hannemann 1996). However, this paper is concerned with compliance problems that arise due to evasion of both direct and indirect types of taxes. Therefore, the size of the shadow economy has a clear advantage as a cumulative measure of tax evasion, which helps to study the influence of different types of taxes on compliance simultaneously. Furthermore, this measure allows for comparison between countries and across different time periods, which enables one to examine how changes in explanatory factors affect changes in tax evasion.

The data on the size of shadow economies were obtained from Schneider, Buehn, and Montenegro (2010). The authors calculated shares of informal economies for a number of different subsamples of countries using the Multiple Indicators Multiple Causes (MIMIC) approach. This approach is based on a theoretical model of the unobserved variables. First, it connects unobserved variables, such as the size of the shadow economy, to observed variables; then the causal relationship between unobserved and observed variables is determined through a structural equations model. This method therefore takes into account the interaction between possible causes of the hidden economy, the size of the shadow economy, and indicators that in theory reflect changes in the size of the shadow economy (Schneider and Enste 2013).

#### Data and measurement: Tax structure

In order to evaluate the influence of tax structures on tax evasion, the main independent variable is measured in the form of tax ratio rather than separate shares of individual taxes. This

approach allows to assess changes in tax evasion caused by changes in tax composition holistically since it represents government's reliance on one type of taxes *relative* to another type of taxes. Many empirical studies follow this strategy (Liu and Feng 2014; Martinez-Vazquez and Vulovic 2011). Pickering and Rajput (2015) also operationalize the composition of taxes as tax ratio when assessing the impact of inequality on tax mix.

Thus, tax structures are defined through the ratio of income taxes to consumption taxes that is calculated using the following equation:

$$TR = \frac{\textit{Taxes on income, profits and capital gains (\% of revenue)}}{\textit{Taxes on goods and services (\% of revenue)}}$$

#### Data and measurement: Other control variables

To control for economic conditions that could influence tax evasion in addition to tax composition, GDP per capita, unemployment rate, and government final consumption expenditure are included in the model. GDP per capita is expected to have a negative sign since tax evasion should be less problematic in more developed economies. The increase in unemployment rate is likely to increase tax evasion because higher levels of official unemployment imply bigger sizes of informal sectors that evade paying taxes. General government final consumption expenditure, which is measured as a percentage of GDP, approximates government's ability to provide public goods and services. It is expected to have a negative sign since higher spending and better public goods provision should stimulate population to comply with tax regulations. The data on these variables as well as information about tax shares were taken from the World Bank statistical database.

The overall quality of government institutions is determined using the Worldwide Governance Indicators. The dataset includes six variables that measure six different dimensions of governance: Voice and Accountability, Political Stability and Absence of Violence/Terrorism, Government Effectiveness, Regulatory Quality, Rule of Law, and Control of Corruption. However, due to high collinearity between these variable, only three of them are included in the baseline specification. Voice and Accountability is an approximate measure of the degree of democracy in a given society; Government Effectiveness reflects citizens' perceptions of the overall quality of the civil service; and Control of Corruption measures the ability of government to control the use of public power for private gain. All these indicators range from -2.5 to 2.5, with the lower numbers indicating weak and higher numbers indicating strong governance performance. Therefore, these variables are expected to influence tax evasion negatively. The numbers were obtained from the Worldwide Governance Indicators (WGI) project website.

Overall, the dataset contains 1,350 observations for 150 countries from 1999 to 2007.<sup>1</sup> The next sections present the main estimation results and discuss the use of different specifications as well as conclusions about stated hypotheses.

## 5. EMPIRICAL RESULTS

Basic descriptive statistics are summarized in Appendix B. The panel dataset is unbalanced due to missing values. Tax ratio has the lowest number of observations (824), while the unemployment rate is known for all countries in all years. The size of the shadow economy ranges from 8.1 % to 68.3 % of GDP with the mean value of 32.4%. Appendix C presents a graph of variation in the size of shadow economies by geographic region. As expected, Central

---

<sup>1</sup> Taiwan was dropped from the sample since there is no data on tax revenues, GDP per capita, unemployment rate, and government expenditures for Taiwan in the World Bank database. The main specification in the paper on the size of shadow economies by Schneider et al. (2010) includes 151 countries.

America, Sub-Saharan Africa, and South America and the Caribbean have the highest median values, while Western and Northern Europe as well as Northern America have the lowest median values of the size of the shadow economies.

As one could notice from the table in Appendix B, tax ratio, GDP per capita, the unemployment rate, and government expenditures have maximum values that are very far from the mean. The distributions of these variables are highly skewed (Appendix D). The mean value of tax ratio is 1.266, the median is 0.711, and the maximum value is 35.95. Similarly, the same issues are observed for the other variables that reflect economic conditions of the country. Therefore, the estimated models incorporate log transformations of tax ratio, GDP per capita, the unemployment rate, and government expenditures rather than their real values. Political variables are not transformed since they are less problematic in this regard.

To examine the differences between OECD members and non-OECD states in the set of studied indicators, a number of simple two sample t-tests were performed. The results show that there are significant differences in the size of shadow economies, GDP per capita, the unemployment rate, government consumption expenditures, and all three political variables between two country groups. However, even though the influence of tax composition on tax evasion appears to differ in developed and developing states, as discussed below, there is no significant difference in tax ratios between OECD and non-OECD nations (t-statistic of a two sample t-test = -1.6157). The implications of these results are stated in the next section.

The results of Fisher-type unit-root tests indicate that the stationarity assumption is violated for the shadow economy, logged GDP per capita and the unemployment rate. Therefore, the estimated models include a linear time trend that corrects for non-stationarity in the case of all the three variables. The preferred specification was estimated using fixed effects; however,

country-specific effects may not fully account for within-cluster error correlation (Cameron and Miller 2015). Moreover, the results of a Wooldridge test and a likelihood ratio test confirmed the presence of first order serial correlation as well as heteroskedasticity within the panel data. Thus, unit clustered robust standard errors were used in this analysis to avoid overstated significance of the results.

Table 1 summarizes estimation results of several models. Column 1 presents the coefficients obtained using the random effects estimator for comparison purposes. Based on the results of a Hausman test, the fixed effects estimator is preferred to allow the country effect to be correlated with the other regressors. Column 2 shows the results of the fixed effects model. The sign of the coefficient on logged tax ratio is negative; thus, an increase in tax revenue from income taxes relative to consumption taxes is expected to decrease tax evasion. The coefficient is very close to the 10% significance level but is not significant. GDP per capita, the unemployment rate, and the Voice and Accountability indicators are all significant predictors of tax evasion and have expected signs based on the results of this model. Higher GDP per capita as well as stronger government performance in terms of freedom of expression and accountability to the people (the Voice and Accountability indicator) are associated with lower tax evasion. Contrarily, an increase in the unemployment rate is expected to increase tax evasion. The trend variable indicates that tax evasion is decreasing over time.

To test the third hypothesis of the difference in the influence of tax composition on tax evasion in developed and developing countries, an interaction term is incorporated in the model. Column 4 in Table 1 presents a specification that includes an interaction between logged tax ratio and the OECD dummy. Even though the OECD dummy is dropped from the model due to perfect collinearity with the fixed effects, the interaction term still allows examination of how tax

structure influences tax evasion in high-income OECD members compared to the rest of the countries (Wooldridge 2012, p. 487).

**Table 1. The Influence of Tax Ratio on the Size of the Shadow Economy**

	<b>Dependent Variable: Size of the Shadow Economy</b>			
	<b>Random Effects</b>	<b>Fixed Effects</b>	<b>Random Effects with Interaction Term</b>	<b>Fixed Effects with Interaction Term</b>
	<b>(1)</b>	<b>(2)</b>	<b>(3)</b>	<b>(4)</b>
<i>Log Tax Ratio</i>	-0.371*	-0.336	-0.509**	-0.468**
	(0.197)	(0.204)	(0.221)	(0.235)
<i>OECD</i>			-7.321***	
			(1.645)	
<i>Log Tax Ratio*OECD</i>			0.840**	0.879**
			(0.334)	(0.343)
<i>Log GDP per Capita</i>	-5.507***	-5.224***	-4.762***	-5.002***
	(0.653)	(0.979)	(0.700)	(1.003)
<i>Log Unemployment Rate</i>	0.428*	0.472*	0.519**	0.515**
	(0.243)	(0.255)	(0.244)	(0.255)
<i>Log Government Expenditures</i>	0.389	0.452	0.504	0.473
	(0.416)	(0.430)	(0.427)	(0.429)
<i>Voice and Accountability</i>	-0.773***	-0.739**	-0.705**	-0.751**
	(0.288)	(0.294)	(0.294)	(0.295)
<i>Government Effectiveness</i>	-0.358	-0.245	-0.298	-0.215
	(0.318)	(0.329)	(0.319)	(0.326)
<i>Control of Corruption</i>	-0.391	-0.304	-0.394	-0.321
	(0.323)	(0.323)	(0.317)	(0.322)
<i>Trend</i>	-0.128***	-0.138***	-0.155***	-0.146***
	(0.029)	(0.036)	(0.032)	(0.037)
<i>Constant</i>	80.915***	78.069***	75.767***	75.896***
	(6.167)	(9.172)	(6.502)	(9.420)
<i>Observations</i>	646	646	646	646
<i>R<sup>2</sup> (within country panels)</i>	0.711	0.712	0.715	0.716

Note: Model 4 incorporates the OECD dummy since an interaction term cannot be included separately from its components. However, it is dropped from the model due to collinearity with the fixed effects. Country clustered robust standard errors are in parentheses. \* p < 0.10, \*\* p < 0.05, \*\*\* p < 0.01.

Interestingly, estimation results change significantly. The coefficient on tax ratio is now significant at the 5% level as well as the coefficient on the interaction term. Moreover, they have opposite signs. Since the size of the shadow economy is only a proxy for tax evasion, one should

be careful when assessing the magnitudes of the estimated effects. Nevertheless, it is useful to understand the exact interpretation of the regression coefficients. Thus, a 10% increase in tax ratio in non-OECD countries is associated with a 0.047 percentage point *decrease* in the size of the shadow economy. However, the same 10% increase in tax ratio in developed OECD countries leads to a predicted *increase* in the size of the shadow economy of 0.041 percentage points  $((0.879-0.468)*0.1)$ . Therefore, the previous finding of an insignificant coefficient on tax ratio overall was masking opposing effects on the shadow economy for OECD and non-OECD countries that canceled each other out on average. Different signs for these two groups of countries may be explained by changing tax collection capacity in developing nations briefly outlined in the fourth section. The discussion of this argument as well as policy implications associated with it are presented in the following section.

The coefficient on GDP per capita shows that a 10% increase in per capita gross domestic product leads to a 0.5 percentage point decrease in the size of the shadow economy. Similarly, a 10% increase in the unemployment rate is associated with a 0.052 percentage point increase in the size of the shadow economy. A one unit increase in the Voice and Accountability score, which measures the degree of citizens' participation in selecting their government and freedom of speech and expression, is expected to decrease the size of the shadow economy by 0.75 percentage points. The only other coefficient that is significant is a linear trend that indicates, on average, each following period of time is associated with a 0.15 percentage point decrease in the size of shadow economies. All other variables are not significant predictors of tax evasion in this model.

The fixed effects estimator does not allow us to directly examine the difference in the size of shadow economies between developed OECD countries and the rest of the states.

Therefore, the random effects model that includes an interaction term and the OECD dummy was also estimated. Column 3 in Table 1 presents the coefficients of this model. Overall, the effects of independent variables are similar in magnitudes and significance to the fixed effects model. The OECD dummy is significant at the 1% level and indicates that high-income OECD member states, on average, have 7.32 percentage points smaller sizes of shadow economies compared to non-OECD countries holding all other variables constant. The next section summarizes the analysis of empirical results and suggestions regarding policy implications based on the findings of the paper.

## 6. DISCUSSION AND POLICY IMPLICATIONS

First of all, one may be concerned with the substantive significance of the results. The magnitudes of the coefficients appear quite small: a 100% increase in tax ratio (i.e., doubling) is expected to decrease the size of the shadow economy by only 0.47 percentage points for all non-OECD countries and increase the size of the shadow economy by 0.41 percentage points for OECD members (based on the results in Column 4). However, the median and the maximum value of tax ratio in the sample equal 0.71 and 35.95 respectively. Therefore, an increase of 1,000% in the median value of tax ratio would mean an addition of 7.1 units to the tax variable. This number is well within the range of observed values. The biggest coefficient obtained as a result of estimations is the coefficient on the OECD dummy. Developed OECD countries, on average, have 7.32 percentage points smaller shadow economies relative to non-OECD states. The policy implications of these results suggest that tax evasion is a very intractable phenomenon, and quite substantial changes in government actions such as significant modifications of tax structures are required in order to deal with this issue.

Second, empirical results confirmed all the three stated hypotheses to certain extent. They will be discussed in reverse order. The third hypothesis is clearly supported by the results: the impact of tax structure on tax evasion is different for the group of developed OECD countries. Tax composition is a significant predictor of tax evasion for all nations; the direction in which this variable influences tax compliance, however, depends on the level of country's development. Furthermore, the difference in tax ratio between the two country groups is not statistically significant even though average sizes of shadow economies are significantly different. This would suggest that the design of tax structures in states with different levels of development should be based on different recommendations. One should carefully consider countries' economic, social, and political realities when trying to apply uniform scientific theories to a wide and heterogeneous group of states. Unique conditions that exist in these societies may influence interactions between different variables in an unexpected way.

The second hypothesis is partially confirmed by the results. While Government Effectiveness and Control of Corruption indicators are insignificant in all the models, the Voice and Accountability score is a significant predictor of the size of shadow economies. Thus, freedom of speech and expression, as well as the extent to which citizens of a country can participate in selecting their government - both usually greater in democratic societies - are expected to decrease tax evasion. In addition, Government Effectiveness and Control of Corruption indicators may be insignificant due to high correlation with the logged GDP per capita variable. However, the exclusion of GDP per capita from the model is likely to create omitted variable bias since this control is obviously an important predictor of tax evasion.

The first hypothesis is confirmed for the group of OECD countries only, where an increase in tax ratio is positively associated with tax evasion. However, non-OECD member

states experience completely opposite effect of tax composition on tax evasion: increasing the amount of revenue from income taxation relative to consumption taxation is expected to decrease the size of the shadow economy. This may be due to the fact that growth in state capacity if not suitably controlled for could lead to a spurious correlation between tax ratio and tax evasion in developing countries. The explanation of this connection could be presented as follows.

Income taxes are usually considered to be difficult to collect (Mansfield 1988). When a country is on its path to development, not only incomes of the population, which are the source of the revenue from income taxes, are growing but the ability of government to collect income taxes is also growing. Official records on income receipts are kept more systematically and government increases its capacity to collect income taxes. However, higher levels of development are associated with lower tax evasion (as indicated by the negative signs on the OECD dummy and GDP per capita). Therefore, the process of nation's development is accompanied by growth of revenues from income taxation and reduction in tax evasion at the same time. This work accounts for the differences in state collection capacity by controlling for the quality of government institutions as well as country's level of development and isolating the influence of tax structure on tax evasion in developing countries from such influence in highly developed states. However, if the effect of tax collection capacity is still important for developing nations, the estimates would be biased to the extent state capacity is not controlled for. The sign of the bias would be negative since this capacity is positively correlated with tax ratio and negatively correlated with tax evasion.

Once a country reaches relatively high stage of development, the direction of the relationship of interest changes. First, tax evasion becomes less problematic in developed societies (seen by the large and negative coefficient on the OECD dummy). Second,

governments are able to better enforce difficult-to-collect taxes (Mansfield 1988) due to increased state tax collection capacity. Thus, the correlation between tax structure and tax evasion in the case of developed nations is less affected by state capacity since it's relatively stable over time. Therefore, an increase in government reliance on income taxation relative to consumption taxation may actually create conditions for higher tax evasion. The policy implications suggest that while developed countries may try address the issue of tax evasion by shifting their preferences from revenues generated by income taxes to revenues from consumption taxes, developing nations should concentrate on increasing their tax collection capacity in order to have more flexibility in terms of the choice of tax instruments.

## 7. CONCLUSIONS AND LIMITATIONS

This paper examines the influence of tax composition on tax evasion using information about 150 countries from 1999 to 2007. The results were obtained by performing fixed-effects regressions in which the main dependent variable, tax evasion, was approximated by the size of the shadow economy. The findings suggest that an increase in the ratio of income taxes to consumption taxes is expected to increase tax evasion in the group of OECD countries, which partially supports the main hypothesis and fully supports the hypothesis about differences in the influence of tax composition on tax compliance in highly developed and developing nations. However, non-OECD countries experience the opposite effect of tax structure on tax evasion: increasing tax ratio leads to decreasing tax evasion. This may be due to the fact that in developing countries the process of development is associated with decreasing sizes of shadow economies and growing revenues from income taxes due to increasing state capacity. Furthermore, an increase in the ability of country's citizens to participate in selecting their

government as well as in freedom of speech and expression is associated with declining tax evasion.

There are a few limitations to this study that are closely related to the nature of the research question. One of the most complicated issues is measuring tax evasion. The size of the shadow economy as a percentage of GDP cannot capture perfectly the extent of tax evasion. Therefore, direct calculations of the gap between the amount of taxes that should be paid and the amount of tax payments actually received by tax authorities for every country would give more clear understanding of the degree of tax evasion. Second, tax data is missing for a large number of observations. The estimates of the effect of tax composition could be very noisy in this case. Constructing a combined dataset from different statistical sources could possibly improve the precision of the results. Moreover, even though the sample of countries is fairly large and contains information about countries that have different levels of development and represent different geographic regions, one may be concerned with the fact that a sampling bias could affect the findings. The problem of missing data may also create a sampling bias since there is a possibility that it is not missing at random. Finally, further research is needed to study the influence of tax collection capacity on the link between tax structure and tax composition in developing countries. Controlling for some approximate measure of state capacity would allow to examine the real relationship between the two variables of interest.

## REFERENCES

- Acosta-Ormaechea, Santiago and Jiae Yoo. 2012. "Tax Composition and Growth: A Broad CrossCountry Perspective." *IMF Working Papers* WP/12/257.
- Allingham, M. and A. Sandmo. 1972. "Income Tax Evasion: A Theoretical Analysis." *Journal of Public Economics* 1:323–38.
- Andreoni, J., B. Erard, and J. Feinstein. 1998. "Tax Compliance." *Journal of economic literature* 36:818–60.
- Arachi, Giampaolo, Valeria Bucci, and Alessandra Casarico. 2015. "Tax Structure and Macroeconomic Performance." *Dondena Working Paper No. 74*.
- Atkinson, A. B. and J. E. Stiglitz. 1976. "The Design of Tax Structure: Direct versus Indirect Taxation." *Journal of Public Economics* 6:55–75. Retrieved (<http://www.blackwellpublishing.com/journal.asp?ref=0020-6598>).
- Bergman, Marcelo S. 2003. "Tax Reforms and Tax Compliance: The Divergent Paths of Chile and Argentina." *Journal of Latin American Studies* 35(3):593–624.
- Boadway, Robin, Maurice Marchand, and Pierre Pestieau. 1994. "Towards a Theory of the Direct-Indirect Tax Mix." *Journal of Public Economics* 55(1):71–88.
- Boadway, Robin W. and Wolfram F. Richter. 2005. "Trading Off Tax Distortion and Tax Evasion." *Journal of Public Economic Theory* 7(3):361–81.
- Brunori, David. 2011. *State Tax Policy: A Political Perspective*. 3rd ed. Washington, DC: Urban Institute Press.
- Cameron, A. Colin and Douglas L. Miller. 2015. "A Practitioner's Guide to Cluster-Robust Inference." *Journal of Human Resources* 50(2):317–72.
- Cebula, Richard J. 2013. "New and Current Evidence on Determinants of Aggregate Federal Personal Income Tax Evasion in the United States." *American Journal of Economics and Sociology* 72(3):701–31.
- Christie, E. and M. Holzner. 2006. "What Explains Tax Evasion? An Empirical Assessment Based on European Data." *wiiw Working Papers from The Vienna Institute for International Economic Studies* # 40.
- Clotfelter, Charles T. 1983. "Tax Evasion and Tax Rates: An Analysis of Individual Returns." *The Review of Economics and Statistics* 65(3):363–73.

- Cremer, H. and F. Gahvari. 1994. "Tax Evasion, Concealment and the Optimal Linear Income-Tax." *Scandinavian Journal of Economics* 96(2):219–39. Retrieved (<Go to ISI>://WOS:A1994NW00600008).
- Cremer, Helmuth, Pierre Pestieau, and Jean-Charles Rochet. 2001. "Direct versus Indirect Taxation: The Design of the Tax Structure Revisited." *International Economic Review* 42(3):781–99.
- Erard, B. and J. S. Feinstein. 1994. "The Role of Moral Sentiments and Audit Perceptions in Tax Compliance." *Public Finance/Finances Publiques* 49:70–89. Retrieved (<Go to ISI>://WOS:A1994RU25600008).
- Feinstein, Jonathan S. 1991. "An Econometric Analysis of Income Tax Evasion and Its Detection." *The RAND Journal of Economics* 22(1):14–35.
- Gruber, Jonathan. 2010. *Public Finance and Public Policy*. 3rd ed. New York: Worth Publishers.
- Lee, Young and Roger H. Gordon. 2005. "Tax Structure and Economic Growth." *Journal of Public Economics* 89(5-6):1027–43.
- Liu, Yongzheng and Haibo Feng. 2014. "Tax Structure and Corruption: Cross-Country Evidence." *International Center for Public Policy Working Paper Series #1427*.
- Mansfield, Charles Y. 1988. "Tax Administration in Developing Countries: An Economic Perspective." *Staff Papers (International Monetary Fund)* 35(1):181–97.
- Martinez-Vazquez, Jorge and Violeta Vulovic. 2011. "Tax Structure in Latin America: Its Impact on the Real Economy and Compliance." *International Studies Program Working Paper Series #1122*.
- Mason, Robert and Lyle D. Calvin. 1978. "A Study of Admitted Income Tax Evasion." *Law & Society Review* 13(1):73–89.
- Murray, Matthew N. 1997. "Would Tax Evasion and Tax Avoidance Undermine a National Retail Sales Tax?" *National Tax Journal* 50(1):167–82.
- Ogbonna, M. N. 1975. "Tax Evasions in Nigeria." *Africa Today* 22(1):53–61.
- Pickering, Andrew and Sheraz Rajput. 2015. "Inequality and the Composition of Taxes." *Department of Economics, University of York Discussion Papers # 15/04*.
- Pommerehne, Werner W., Albert Hart, and Bruno S. Frey. 1994. "Tax Morale, Tax Evasion and the Choice of Policy Instruments in Different Political Systems." *Public Finance* 49:52–69.
- Pommerehne, Werner W. and Hannelore Weck-Hannemann. 1996. "Tax Rates, Tax Administration and Income Tax Evasion in Switzerland." *Public Choice* 88(1/2):161–70.

- Sam, Choon Yin. 2010. "Exploring the Link between Tax Evasion and the Underground Economy." *Pakistan Economic and Social Review* 48(2):167–82.
- Schneider, Friedrich and Andreas Buehn. 2013. "Estimating the Size of the Shadow Economy: Methods, Problems and Open Questions." *CESifo Working Paper No. 4448*.
- Schneider, Friedrich, Andreas Buehn, and Claudio E. Montenegro. 2010. "Shadow Economies All Over the World: New Estimates for 162 Countries from 1999 to 2007." *Policy Research Working Paper Series 5356*.
- Schneider, Friedrich and Dominik H. Enste. 2013. *The Shadow Economy: An International Survey*. 2nd ed. New York: Cambridge University Press.
- Slemrod, J. 1985. "An Empirical Test for Tax Evasion." *The Review of Economics and Statistics* 67(2):232–38. Retrieved (<http://www.jstor.org/stable/1924722>).
- Slemrod, J., M. Blumenthal, and C. Christian. 2001. "Taxpayer Response to an Increased Probability of Audit: Results from a Controlled Experiment in Minnesota." *Journal of Public Economics* 79:455–83.
- Slemrod, Joel. 2007. "Cheating Ourselves: The Economics of Tax Evasion." *Journal of Economic Perspectives* 21(1):25–48.
- Spicer, M. and L. Becker. 1980. "Fiscal Inequality and Tax Evasion: An Experimental Approach." *National Tax Journal* 33(2):171–75.
- Tanzi, Vito and Parthasarathi Shome. 1993. "A Primer on Tax Evasion." *Staff Papers - International Monetary Fund* 40(4):807–28.
- Torgler, Benno and Friedrich Schneider. 2009. "The Impact of Tax Morale and Institutional Quality on the Shadow Economy." *Journal of Economic Psychology* 30(2):228–45.
- Vogel, Joachim. 1974. "Taxation and Public Opinion in Sweden: An Interpretation of Recent Survey Data." *National Tax Journal* 27(4):499–514.
- Watrin, Christoph and Robert Ullmann. 2008. "Comparing Direct and Indirect Taxation: The Influence of Framing on Tax Compliance." *The European Journal of Comparative Economics* 5(1):33–56. Retrieved (<http://eaces.liuc.it/18242979200801/182429792008050102.pdf>).
- Wooldridge, Jeffrey. 2012. *Introductory Econometrics: A Modern Approach*. 5th ed. South-Western College Pub.
- Xing, Jing. 2011. "Does Tax Structure Affect Economic Growth? Empirical Evidence from OECD Countries." *Oxford University Centre for Business Taxation Working Paper WP11/20*.

Yitzhaki, S. 1974. "A Note on Income Tax Evasion: A Theoretical Analysis." *Journal of Public Economics* 3:201-2.

## APPENDICES

### APPENDIX A: Variables Definition and Sources

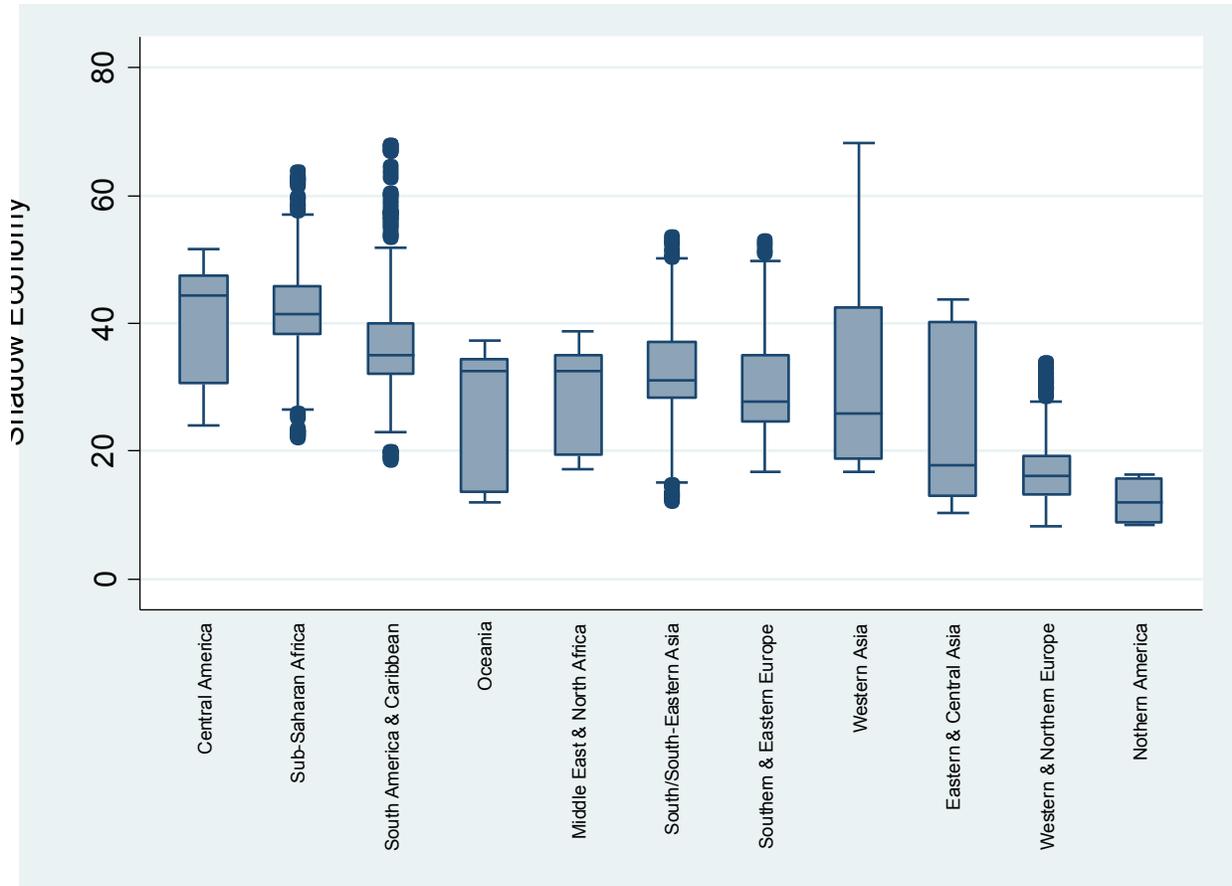
<b>Variable</b>	<b>Definition</b>	<b>Source</b>
Size of Shadow Economy	Sizes of shadow economies were calculated using the Multiple Indicators Multiple Causes (MIMIC) approach and are expressed as a % of GDP	Schneider, Buehn, and Montenegro (2010)
Tax Ratio	The ratio of income taxes to taxes on goods and services. Taxes on income, profits, and capital gains are levied on the actual or presumptive net income of individuals, on the profits of corporations and enterprises, and on capital gains, whether realized or not, on land, securities, and other assets. Intragovernmental payments are eliminated in consolidation. Taxes on goods and services include general sales and turnover or value added taxes, selective excises on goods, selective taxes on services, taxes on the use of goods or property, taxes on extraction and production of minerals, and profits of fiscal monopolies.	World Development Indicators, World Bank
GDP per capita, PPP (constant 2011 international \$)	GDP per capita based on purchasing power parity (PPP). PPP GDP is gross domestic product converted to international dollars using purchasing power parity rates. An international dollar has the same purchasing power over GDP as the U.S. dollar has in the United States. GDP at purchaser's prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion	World Development Indicators, World Bank

	and degradation of natural resources. Data are in constant 2011 international dollars	
Unemployment Rate, total (% of total labor force) (modeled ILO estimate)	Unemployment refers to the share of the labor force that is without work but available for and seeking employment	World Development Indicators, World Bank
General Government Final Consumption Expenditure (% of GDP)	General government final consumption expenditure includes all government current expenditures for purchases of goods and services (including compensation of employees). It also includes most expenditures on national defense and security, but excludes government military expenditures that are part of government capital formation	World Development Indicators, World Bank
Voice and Accountability	Reflects perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media	Worldwide Governance Indicators, 2014 Update, World Bank
Government Effectiveness	Reflects perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies	Worldwide Governance Indicators, 2014 Update, World Bank
Control of Corruption	Reflects perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests	Worldwide Governance Indicators, 2014 Update, World Bank

## APPENDIX B: Summary Statistics

Variable	Observations	Mean	Median	Standard Deviation	Minimum	Maximum
Shadow Economy	1340	32.39657	32.8	12.68836	8.1	68.3
Tax Ratio	824	1.266035	.7107317	2.710878	.0341217	35.94821
Log Tax Ratio	824	-.3386747	-.341461	.9465677	-3.377822	3.582079
GDP per capita	1325	17124.57	8840.465	20455.86	397.1919	126817.5
Log GDP per Capita	1325	9.034919	9.087094	1.294606	5.98442	11.7505
Unemployment Rate	1350	8.480519	7.1	5.991562	.5	38.6
Log Unemployment Rate	1350	1.918554	1.960095	.685225	-.6931472	3.653252
Government Expenditures	1307	15.39055	14.86086	6.222104	2.060382	69.54283
Log Government Expenditures	1307	2.65172	2.698731	.4181328	.7228914	4.241943
Voice and Accountability	1050	-.0348762	-.12	.9596103	-2.14	1.83
Government Effectiveness	1050	.0581905	-.165	1.001605	-2.25	2.37
Control of Corruption	1050	.0186	-.255	1.027643	-1.82	2.59

#### APPENDIX C: Shadow Economy by Geographic Regions



APPENDIX D: Distributions of Economic Variables

