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VAT GAP IN THE EUROPEAN UNION:
AN EMPIRICAL ANALYSIS

Módulo: Economía del Sector Público

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ABSTRACT

For welfare systems whose backing relies mainly on the tax revenues collected, tax non-compliance is an issue of great importance. Concretely in the European Union, a considerable amount of tax revenue is lost in terms of VAT. This is the so-called VAT Gap, the term that stands for the difference between the VAT Total Tax Liability and the VAT revenue actually collected. In view of the importance of this matter, and of the lack of awareness of which factors affect such VAT non-compliance, this study aims to throw some light by means of an econometric model on whether or not shadow economy, decentralization, institutional quality, missing trader fraud, VAT standard rates, or the amount of 500 euro bills available each year for each member state affect the VAT Gap. To that purpose, the model will be based on panel data including information on those variables for the 28 Member States of the European Union and for the years 2012 to 2016. The main findings of the study are the following. First, higher institutional quality is found to affect negatively to the VAT Gap. Second, a higher fiscal decentralization appears to decrease significantly the VAT Gap. Third, higher amounts of 500 euro bills annually available increase such gap. Other variables checked do not appear to be significantly determinant of the VAT non-compliance in this model as can be seen in the results.

KEYWORDS AND JEL

VAT Gap; Shadow Economy, Quality of Government, Intra-Community trade, Tax Morale, Missing Trader Fraud.

JEL: H20, H26.

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LIST OF ACRONYMS AND ABBREVIATIONS

MTIC: Missing Trader Intra-Community.

GFCF: Gross Fixed Capital Formation.

NPISH: Non-Profit Institutions Serving Households.

VTTL: VAT Total Tax Liability.

SUT: Supply and Use Table.

TAXUD: Taxation and Customs Union Directorate-General of the European Commission.

EMPACT: European Multidisciplinary Platform Against Criminal Threats.

MIMIC: Multiple Indicators Multiple Causes.

EQI: European Quality of Government Index.

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1. INTRODUCTION: WHAT AFFECTS THE VAT GAP IN EUROPE?

Awareness for the VAT revenue loss across the Europe has increased over the last years. The main reason for this is that when quantifying such loss, it amounts to an average of 5,953 million euros in the European Union Member States. Thus, the European Commission has been tasking a yearly study of the VAT Gap in each country and in all Europe.

These reports provide estimates of the VAT Gap for the EU Member States since 2013, which was first conducted by Barbone *et al.* in 2013, and updated there on. The latest version was published in 2018 and contains data of 2016. The VAT Gap addressed in detail by those reports, refer to the differences between the expected and actual VAT revenues. It is defined as the difference between the amount of VAT collected and the VAT Total Tax Liability (VTTL) and, apart from fraud and evasion and their associated policy measures, it also represents VAT lost due to insolvencies, bankruptcies, administrative errors, and legal tax optimization.

Although detailed information on the measurement procedure of the VAT Gap is available therein, no econometric model testing for the variables determining such Gap was carried out until the latest version.

When trying to explain the VAT Gap along the EU Members, they proved substantial differences in their levels and that enhanced the interest of this paper on showing whether or not some variables – i.e. quality of institutions, the shadow economy, fiscal decentralization levels, or the amount of 500 euro bills available annually) – could determine the size of the VAT Gap across EU Member States.

This study focuses exclusively on the 28 Member States of the European Union in the period of 2012 to 2016

The main findings of the study are the following. First, higher institutional quality is found to affect negatively to the VAT Gap. Second, a higher fiscal decentralization appears to decrease significantly the VAT Gap. Third, higher amounts of 500 euro-bills annually available increase such gap. Other variables checked do not appear to be significantly determinant of the VAT non-compliance in this model as can be seen in the results.

The reminder of the paper is structured as follows: In Section 2, the theoretical framework is discussed. In Section 3, the relevant literature on VAT gap and some variables that might determine it is discussed. Section 4 presents the data and hypothesis utilized. Then, the empirical model and estimations are presented in Section 5 and finally findings and policy

applications are addressed in Section 6. Bibliography can be found in Section 7 and further information in the Appendix.

2. THEORETICAL FRAMEWORK

The Value-added tax (VAT) is a kind of tax which is assessed incrementally, based on the value-increase of products or services in every stage of their production or distribution. It was first implemented by Germany and France as a general consumption tax during World War I. This tribute basically finances the services and infrastructure a certain government level may provide for its citizens. Thus, taxpayers get, in a way, public goods and services in exchange for their contributions; nevertheless, in legal systems that choose to implement VAT, its payment is compulsory, no matter what public goods or services the taxpayer may receive afterwards.

This tax is generally implemented as a destination-based tax, that is: basing the tax rate on the location of the consumer and applying it as a percentage of the sales' final price.

Although VAT system is not applied in every state, it is in almost every country that has full UN membership.

Two main methods exist to calculate VAT: the invoice-based method or credit-invoice method, and the accounts or subtraction-based method. The first method is the most widely used method. It leads to the taxation of sales transactions with the customer informed of the VAT at the time of the transaction; business might after consuming be recipient of a credit for the VAT paid on input goods or services. Regarding the second method, the subtraction method, business calculate the value of all taxable sales after each reporting period and afterwards subtract the sum of all taxable purchases. The VAT rate is then applied to the difference. The invoice-based method is the one used in the European member states.

The value-added effect is achieved by banning final consumers from recovering VAT on purchases, but allowing businesses to do so. Final consumers do not only pay for the VAT of the final product but also for the VAT of the entire production process because this tax is always included in the price of each stage in the production chain.

Regarding the different ways of implementing the VAT, two issues must be taken into account: the method of collection and the timing of collection. Regarding the way of collecting of this tax, two approaches exist: the invoice-based method and the accounts-based method. Under the first approach, sellers charge VAT on their output and gives the buyer a special invoice where the VAT amount charged is indicated. Therefore, buyers that are subject to output tax consider the tax on purchase invoices as input tax and afterwards

deduct them from their VAT liability. According to this method, depending on whether the difference between output and input tax is positive or negative, it is paid to, or refunded by the tax authorities each time the reporting period comes to an end. Under the second approach, the accounts based-method, no specific invoices are used; alternatively, the tax amount is calculated on the value added itself, measured as the difference between revenues and allowable purchases. The later method is by far the least common one, only used in Japan as mentioned above. Regarding the timing of collection, VAT, in line with accounting, can be either accrual or cash based.

Although VAT method seems to be easy and cheap, and an effective way to finance public goods and services, it also has some counterparts as any other intervention in the free market. It increases prices and consequently decreases the quantity of goods traded, resulting in a greater loss due to supply and demand shifts than the gain obtained from it and leading to the so-called deadweight loss. Nevertheless, this system relies on the fact that the total utility increase surpasses the total utility decrease. This does not imply that there is many people that are worse off by more than tax authorities are better off by it, but if the income lost due to VAT were greater than the tax authorities' income coming from it, this system would be inefficient and governments should rethink its use.

Regarding its compliance, there is some trouble in fulfilling the task of getting to collect what actually corresponds. This is due to many factors. Mainly fraud and tax evasion because, as previously stated, there are people who are better off without the VAT system and therefore have many incentives to avoid compliance. Also insolvencies, administrative errors, and legal tax optimization are responsible for the non-collected VAT which is measured by the VAT Gap.

3. LITERATURE REVIEW

VAT system is the basis of a self-enforcement mechanism where consumers have incentives to charge the tax in order to afterwards get back the money paid in terms of input taxes. This is the reason why the literature defines VAT as a “money machine” (Keen and Lockwood, 2006) Nevertheless, this same rule does not apply to final consumers since they are not allowed to deduct the input tax and therefore have incentives to evade taxes. If these incentives were to make the final consumer commit a *non-compliance crime*, he/she would need to be accomplices with the retailer so that no VAT was charged at all.

The VAT Gap, which will be addressed in this study, represents more than just fraud and evasion, it also covers VAT lost due to, for example: insolvencies, bankruptcies,

administrative errors, and legal tax optimization. It is a phenomenon that takes place as a result of tax noncompliance for different motives.

In line with the purpose of this study, which is to reveal whether or not variables such as *shadow economy*, *Institutional Quality*, *de-centralization*, *Community acquisitions*, and *stock of EUR 500 bills* are determinants of the VAT Gap in EU Member States, a review of the literature might be helpful to understand how these variables are measured and the conclusions other authors have come to.

3.1 Main variable – VAT Gap

VAT Gap

This subsection contains a review of the literature that has been considered of utmost relevance on VAT Gap.

The VAT Gap is a measure of tax non-compliance. The European Commission has been publishing studies and reports on its size in the EU Member States. This study was first conducted by Barbone *et al.* in 2013, and its latest version is the *Study and Reports on the VAT Gap in the EU-28 Member States: 2018 Final Report*, which was carried out by a team of experts from CASE (Center for Social and Economic Research, Warsaw) and IEB (Barcelona Institute of Economics) and coordinated by the IHS (Institute for Advanced Studies).

The concept of VAT Gap has been measured therein as the difference between the VAT Total Tax Liability (VTTL) (sometimes addressed as VAT Total Theoretical Tax Liability) according to the tax law and the actual VAT revenue collected.

Throughout these studies and reports on the VAT Gap in the EU Member States, VTTL has been computed by deriving the expected VAT liability from the observed national accounts data, such as supply and use tables (SUT). Concretely, VAT liability has been estimated for final household, government, and Non Profit Institutions Serving Households (NPISH) expenditures; non-deductible VAT from intermediate consumption of exempt industries; and VAT from Gross Fixed Capital Formation (GFCF) of exempt sectors. Furthermore, also country-specific tax regulations such as exemptions for small business under the VAT thresholds; non-deductible business expenditures on good, drinks and accommodation; and restrictions to deduct VAT on leased cars were taken into account.

As the quality and availability of SUT data varied greatly country by country and year by year, the authors of these reports estimated some missing expenditure and investment figures which were not available by using industry- and sector-specific growth rates and

taxable shares. This has led to a subsequent need of frequent revision of previous estimates whenever actual national accounts data has been published or new information on taxable investment became available.

The latest version of these Reports has concluded that, in nominal terms, in 2016, the VAT Gap in EU-28 Member States fell below EUR 150 billion and amounted to EUR 147.1 billion. The estimated VTTL was of EUR 1,194.4 billion, whereas the VAT revenue was of EUR 1,047.3 billion. These numbers can be translated to relative terms as: a VAT Gap share of 12.3 percent of the VTTL, the lowest value in the analyzed period of 2012-2016.

Along the EU-28 Member States, the VAT Gap share decreased in 22 countries and increased in six – concretely, Romania, Finland, the UK, Ireland, Estonia, and France –. The smallest Gaps were observed in Luxembourg, Sweden, and Croatia whereas the largest were found in Romania, Greece, and Italy. Table 1.1 ranks the five members with the largest and smallest VAT Gap in 2016.

Table 1. Five largest and smallest VAT Gaps in EU, 2016 (relative terms)

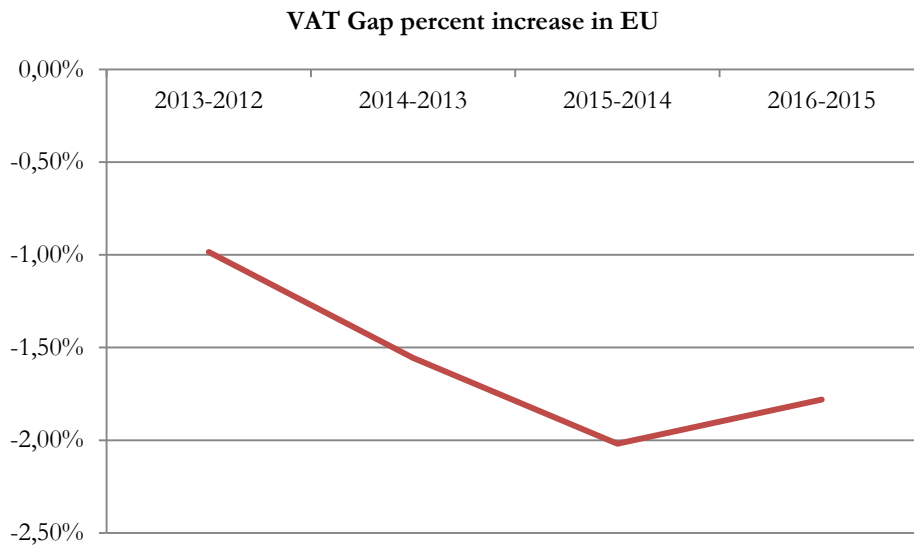
COUNTRY	VAT GAP (%)*
LARGEST	
Romania	35.88%
Greece	29.22%
Italy	25.9%
Slovakia	25.68%
Lithuania	24.52%
SMALLEST	
Luxemburg	0.85%
Sweden	1.08%
Croatia	1.15%
Spain	2.71%
Malta	2.71%

Source: TAXUD/2015/CC/131;

* VAT Gap (%) stands for the VAT Gap in terms as a share of VTTL.

Addressing the VAT Gap issue and the factors that enhance it is of vital interest for authorities since great recollection is lost through it. Measures are being taken and they are slowly might be showing their fruits as it can be seen in Figure 1.1, which shows a negative trend of the increase in the period 2012-2016.

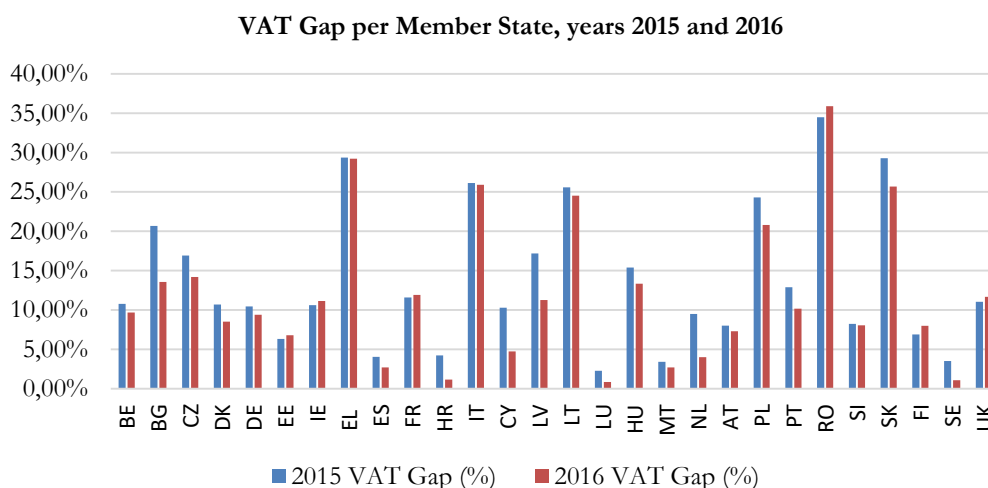
Figure 1 VAT Gap percentage increase in EU, 2015-2016



Source: TAXUD/2015/CC/131, own calculations

Concretely, latest data available is shown in the figures below. Figure 2.1. represents the VAT Gap as a percentage of the VTTL for each member state in the years 2015 and 2016. Probably the most striking aspect of this figure is how big the variability of the gap is across countries. This should be a good-enough reason to go deeper on the factors that might affect VAT non-compliance in the different European Member States and afterwards try to mitigate the problem once knowing its real causes.

Figure 2.1 VAT Gap estimates, 2015 and 2016 (relative terms)

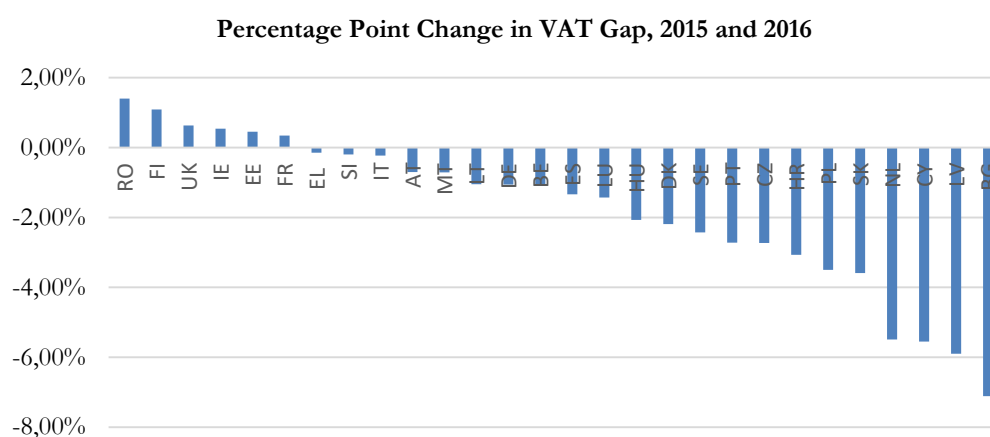


Source: TAXUD/2015/CC/131

Figure 2.2., which shows the percentage point change in VAT Gap from 2015 to 2016 for each Member State, shows that, despite the trend of the gap seems to be decreasing, this statement does not hold true for every member state. Six countries' VAT Gap increased from 2015 to 2016. Namely, Romania, Finland, United Kingdom, Ireland, Estonia and France, ordered from greater to smaller increase in VAT non-compliance.

On the other side, from those who had a decreasing VAT gap, Bulgaria, Latvia, Cyprus, and the Netherlands stand out as those with the larger increase, being this, in all cases, larger than 0.05 points.

Figure 2.2 Percentage Point Change in VAT Gap from year 2015 to 2016



Source: TAXUD/2015/CC/131

In the last report, an econometric analysis of VAT Gap determinants was included for the first time in this series of reports. Among the explanatory variables taken into account, the unemployment rate; a country variable of government effectiveness; and of age structure could be found. Furthermore, as they wished to include the productive structure of each country, the following sectors were inserted as explanatory variables too: retail, real estate, construction, industry, telecommunications, and art. The sum of all these sectors amounted to a 100 once sectors not subject or exempted from VAT had been excluded. As VAT tax rates do not change frequently, they took the dispersion of tax rates within a country to control. Moreover, to infer the impact of the tax administration, they employed variables that promote voluntary tax compliance – namely, the scale of the Tax Administration; the Information and Technology Expenditure; and the Public Deficit. Finally, as further controls in all regressions, population and GDP per capita were included. See TAXUD/2015/CC/131 for more detail.

3.2 Possible determinants of the VAT Gap

3.2.1. Shadow economy

The number of studies investigating underground economy have strongly increased in the last decades. This topic is of extreme relevance as it explains tax revenue losses Member States have to deal with. Nonetheless, the fact that it has been more and more studied does not at all imply that it is a simple matter. In fact, obtaining accurate information is not even possible because, due to its illegitimate nature, individuals taking part in the informal sector try not to be discovered and thus, all information is based on estimations which, of better or worse quality, are still estimations.

Vast literature on Shadow Economy can be found. Schneider and Buehn (2012a) claim that, even if the size of the shadow economy and of tax evasion are not congruent, activities in the shadow economy often imply the evasion of direct or indirect taxes, so that factors affecting tax evasion will very likely affect the shadow economy too.

Schneider (2005 a) states that “*the shadow economy contains all market-based legal production of goods and services that are deliberately concealed from public authorities with the aim of avoiding payment of income, value added or other taxes and social security contributions; certain labor market standards, such as minimum wages, maximum working hours, or safety standards, and compliance with certain administrative procedures.*”

Decentralization, tax morale and institution quality have been popular the most studied variables when trying to explain shadow economy. Results have shown that decentralization has an ambiguous effect as deeply explained below, and tax morale, and the institutional quality level appeared to have a negative effect. See Buehn *et al.* in 2011, for more detail.

3.2.2. Decentralization

The variable of de-centralization has widely been analyzed as a potential determinant of the shadow economy. Oates (1972), argued in his *Decentralization Theorem* that decentralizing the supply of public goods and services lead to social benefits such as a more efficient provision due to better knowledge of its citizens’ preferences and, therefore, better satisfaction. This aspect is of supreme importance because, despite paying taxes does not formally entitle to direct benefits, part of what determines if taxpayers act dutifully or not depends on whether or not they get back what they consider a fair share of the taxes they pay. Through decentralizing the supply of public goods and services, and therefore getting to know better residents’ preferences, a better match of what is supplied and what

taxpayers consider a fair share of the taxes could be achieved. This would undoubtedly lead to a higher degree of honorability of contribution duties.

Furthermore, decentralization brings the government closer to the people and hence, the task of monitoring and surveillance improves, what results in an increasing likelihood of detection and punishment of tax noncompliance. This increase in governments' efficiency subsequently decreases shadow economy and increases tax morale and social intervention. (Allingham and Sandmo, 1972).

Other researchers (see Torgler *et al.* 2010) have added that the efficiency following decentralization also increases the acceptance for state interventions and the tax morale of those conforming that system.

Unsurprisingly, this approach has had critiques because it is not believed that financial considerations of enforcement are enough to explain compliance behavior (Webley *et al.* 1991). In fact, were this to be the only consideration, given the relatively low rates of audits and fines taxpayers face, no income would be reported. For this reason, further analysis should be carried out to explain what motivates taxpayers to fulfill their duty.

Decentralizing also embodies a counterpart of negative effects that leave room for the uncertainty of which the final impact on the degree of tax compliance will be. Coordination problems or interjurisdictional spillovers are examples of the negative effects that may arise due to decentralization and lower the marginal costs of acting in the unofficial part of the economy (Prud'homme, 1995).

Regarding the methods used to measure Fiscal Decentralization, many papers have used the revenue approach. Concretely, in an experimental study carried out by Werner *et al.*, (2004), tax morale was proven to be definitely lower in cases where taxes were spent centrally than in cases those where they were spent sub-centrally. Furthermore, Barone and mocetti (2011) investigated the link between the inefficiency (which increases with centralization) of public spending and tax morale and found that there was a negative effect. Therefore, more efficiency is thought to lead to more tax morale.

3.2.3 Tax morale

Despite some scholars have assumed that the extent of tax evasion is negatively correlated with the probability of detection and the degree of punishment (Allingham and Sandmo (1972), others argued that the choice between tax compliance and evasion does not only result from sanctions but also from a set of attitudes and norms (Spicer and Lundstedt (1974).

Many papers have been written with the aim of trying to find out the reasons why people fulfill or not the duty they have with their corresponding tax authorities. In this field, the concept of *tax morale* is in vogue. The term was coined by Schmolders back in 1960, who defined it as “the attitude of a group or the whole population of taxpayers regarding the question of accomplishment or neglect of their tax duties” (Schmolders, 1960). Since then, it has been victim of the attribution of different definitions and names: “internalized obligation to pay tax” (Feld and Frey (2002), Braithwaite and Ahmed (2005), “intrinsic motivation” (Alm and Torgler (2006). Others related the term to a civic duty (Orviska and Hudson (2002), or renamed it as *taxpayer ethics*: “the norms of behavior governing citizens as taxpayers in their relationship with the government” (Song and Yarbrough, 1978).

A widely spread paradigm for analyzing tax compliance behavior was developed by Allingham and Sandmo (1972) and Srinivasan (1973), who applied the general theory of criminal behavior first evolved by Becker (1968). It is the so-called “economics-of-crime paradigm” and views the decision of whether or not to pay taxes as an individual choice between two lotteries. The first consists of the sure option of paying taxes and the second implies the risky choice of evading taxes. Through this paradigm, tax compliance is understood as the result of a rational ‘portfolio’ decision by a single taxpayer. Here is when efficiency provided by de-centralization takes place. The first choice, as mentioned before, provides the government with the necessary tools to better monitor its citizens and therefore increases their probability of detection and punishment in case of fraud. In terms of this rational ‘portfolio’ decision, this alternative can be translated into an increase in the marginal cost of infringing and, therefore, into a decrease in the probability of entering the unofficial economy. However, it is widely thought that in the concrete context of tax compliance, an intrinsic motivation exists to economically contribute to societies through tax paying (Frey 1994, 1997) and thus, that not only financial considerations should be taken into account to understand tax compliance. For this reason, the “economics-of-crime” paradigm shall not be considered a ‘formula’ to explain compliance behavior.

As it appeared to Pommerehne *et al.* in 1994, the main challenge of tax morale is that it cannot be measured directly. It can only be assessed by looking at its effects. In any case, this does not doubt its importance when it comes to the explanation of tax compliance. Surveys take an important role in eliciting and analyzing tax morale.

Alm and Torgler (2006) investigated the simple correlation between tax morale and the size of the shadow economy in Europe and the United States and found a strong negative

correlation, what means that an increase in tax morale increases shadow economy. Significant differences across European countries were found in that study.

Alm and McClellan (2012) studied the effect of tax morale on tax compliance behavior and their reported results show that tax morale considerations are the same for firms and individuals. Dell'Anno (2009) showed that tax morale could account for the level of aggregate tax evasion and that depended on taxpayers' inner attitudes toward honesty and social stigma. Torgler *et al* (2008) found a significant correlation between tax evasion and tax morale after controlling factors such as tax administration, tax system and the perceived tax burden, tax awareness, compliance perceptions, trust in authorities and other citizens, corruption, willingness to obey the law, and religiosity.

3.2.4. Institutional quality

Institutional quality of governments has gained popularity for its effects on both the magnitude of the informal sector that countries have, and the tax ethics their taxpayers present. Bird *et al.*, (2006) already stated that not only the economic but also de political system affect formal and informal economic activities. In fact, it has already been showed that improving social institutions decreases the incentives for firms to go underground. (Torgler and Schneider, 2009).

Quality of Governance has been widely used as a proxy of institutional quality. Lack/control of corruption, the strength of the rule of law, and bureaucratic quality (also referred to as government effectiveness) have been proved to be its most measurable components. Due to the existent high correlation among these cross-country indicators, comparative scholars thought of a term that would encompass all the indicators: "quality of government" (QoG). Rothstein and Teorell (2008) defined this concept as an impartial, efficient and non-corrupt government.

Charron *et al.*, 2010 revealed that there is a significant variation among many of the member states' institutional quality in the EU. They found that the World Bank's 'World Governance Indicators' (WGI) (Kaufman, Kraay and Mastruzzi 2009) data would be the most appropriate source on which to build an indicator of QoG for EU Members.

3.2.5. Missing Trader fraud

The Missing Trader Fraud, is also known as Intra-Community (MTIC) or *Carousel Fraud*.

It consists of the theft of VAT from a government through a multi-jurisdictional trading where transactions take place in VAT-free jurisdictions that allow the thief to charge VAT on goods sold and, instead of giving the corresponding output-VAT revenue in to the collection authority, the trader goes missing.

A subtle difference exists in the terms used to coin VAT fraud of this kind. It relies on how complex the structure and process to defraud is. While the term “Missing Trader fraud” would stand for the basic procedure just explained, the term “Carousel fraud” would do so for a more complex strategy that keeps going round and round as a carousel. It may take different forms and sizes, but the essential issue is basically the same: no VAT is chargeable on cross-border transactions between the UE-Member States and this provides an opportunity to commit fraud as it will be explained.

VAT fraud is one of the nine EMPACT priorities, the European Union’s priority crime areas. Europol’s Analysis Project MTIC’s objective consists, among others, on the identification and dismantling of organized criminal networks involved in cross-border VAT fraud. The total figure of the MTIC VAT Gap in 2014 was of EUR 94 billion, representing the 0.67% of the EU-28 GDP.

Actually, MTIC is the most common form of VAT fraud as the Europol states. It involves organized, sophisticated activities that aim to exploit differences in VAT treatments along EU Member States. A structure of linked companies is created by criminals across states and then both national and international trading and revenue-accounting procedures are abused.

This crime aims to wring out current harmonized VAT system. It relies in a transitional VAT regime for intra-Community supplies of goods in which VAT is applied only to sales within a Member State at the applicable domestic rate and allows VAT-free trading across Member State borders. It enables traders to import goods without directly accounting for the VAT. In plain MTIC cases, fraudsters sell the goods, charge the VAT to buyers, and do not remit that value to Commissioners.

Cases of VAT fraud with greater complexity are better known as carousel fraud cases. Here, goods are imported and sold by a series of companies before they are exported again. The first company in the domestic chain, the ‘missing trader’, charges VAT to a customer but does not pay it to the tax authorities. Exporters of the goods claim and receive reimbursement of VAT payments that did not effectively happen. Missing traders usually operate only some months and afterwards disappear.

In this study, the amount of intra-community transactions will be considered relevant due to the assumption that more intra-community transactions increase the probability of existence of MTIC fraud that, undoubtedly, affects the VAT Gap in the European Member States.

4. DATA AND HYPOTHESIS

4.1 VAT Gap

VAT Gap, which is the explanatory variable in this paper, has been studied in detail in the “Study and Reports on the VAT Gap in the EU-28 Member States” carried on for the European Commission as mentioned before.

In these reports, available since 2013, authors present the VAT Gap estimates for years 2012-2016. These were the data source for this study. Therein, VAT Gap is measured as the difference between the amount of VAT collected and the VAT Total Tax Liability (VTTL) –namely, the tax liability according to tax law. Data used for this paper’s model will be expressed as a ratio of the VTTL:

$$VAT\ Gap = \frac{VTTL - VAT\ revenue}{VTTL}$$

Where VTTL is computed by deriving the expected VAT liability from the observed national accounts data, such as supply and use tables (SUT). Concretely, VAT liability has been estimated for final household, government, and Non Profit Institutions Serving Households (NPISH) expenditures; non-deductible VAT from intermediate consumption of exempt industries; and VAT from Gross Fixed Capital Formation (GFCF) of exempt sectors.

Regarding the VAT revenue, it can be expressed as the product of three components: Net base, Effective rate, and Compliance Gap:

$$VAT\ revenue = Net\ base \times Effective\ Rate \times Compliance\ Gap$$

Table 2.1. Shows data on the revenues, the VTTL, and the VAT Gap in million euros and the VAT Gap expressed as a percentage of the VTTL for year 2016. The same tables for previous years can be found in tables A.1. - A.4 in the Appendix.

Table 2. VAT Gap estimates, 2016 (EUR million)

Countries	Codes	Revenues	VTTL	VAT Gap	VAT Gap (%)*
Belgium	BE	28722	31801	3079	9,68%
Bulgaria	BG	4417	5110	693	13,56%
Czech Republic	CZ	13091	15256	2165	14,19%
Denmark	DK	26519	28985	2466	8,51%
Germany	DE	218784	241463	22679	9,39%
Estonia	EE	1974	2118	144	6,78%
Ireland	IE	12826	14436	1610	11,15%
Greece	EL	14333	20249	5916	29,22%
Spain	ES	70591	72557	1966	2,71%
France	FR	154430	175326	20896	11,92%
Croatia	HR	6016	6086	70	1,15%
Italy	IT	102957	138945	35988	25,90%
Cyprus	CY	1664	1746	83	4,73%
Latvia	LV	2032	2290	258	11,27%
Lithuania	LT	3026	4009	983	24,52%
Luxemburg	LU	3416	3445	29	0,85%
Hungary	HU	10587	12216	1629	13,33%
Malta	MT	729	749	20	2,71%
Netherlands	NL	48557	50581	2024	4,00%
Austria	AT	27300	29449	2149	7,30%
Poland	PL	30479	38483	8004	20,80%
Portugal	PT	15770	17554	1784	10,16%
Romania	RO	10968	17105	6137	35,88%
Slovenia	SI	3315	3604	290	8,04%
Slovakia	SK	5420	7292	1872	25,68%
Finland	FI	19694	21401	1707	7,98%
Sweden	SE	42770	43236	465	1,08%
United Kingdom	UK	166866	188906	22040	11,67%

Source: TAXUD/2015/CC/131; *VAT Gap (%) stands for the VAT Gap in terms as a share of VTTL.

In nominal terms, the greater VAT Gap that can be appreciated for year 2016 is of 35988 million euros and it is Italian legacy; the smallest VAT Gap amounts to 20 million euros and corresponds to Malta. In relative terms, the highest value is for Romania (35.88%) whereas the lowest one can be attributed to Luxemburg (0.85%).

Once again, VAT-compliance gaps, either in nominal or relative terms, differ substantially among the European Member States; it may be due to their particularities in economical and social situations.

4.2 Shadow economy

Shadow economy (*SE*) has been estimated through different methodologies that can be divided into direct or indirect. Although this study focused on indirect approaches, four direct micro approaches are worth mentioning:

4.2.1 Discrepancy Method (Measurement by the System of National Accounts Statistics)

4.2.2 Survey technique approach

4.2.3 Surveys of company managers

4.2.4 Estimation of the consumption-income-gap of households

Although the methodologies explained above have widely been used, due to the macro-vision of this study, indirect macro approaches, also named “indicator” approaches, would suit better.

Five methodologies should be outlined, and some details given so as to understand why the MIMIC model explained below was thought to be the best for this study’s purposes. They are:

4.2.1. Discrepancy between national expenditure and income statistics:

This approach assumes that there is no error in the measurement of elements composing the expenditure side and that they are constructed in a way that they are independent from income factors, which is not easily plausible.

4.2.2 Discrepancy between official and actual labor force:

This method consists of assuming a constant labor force participation and therefore, categorizing as an increase in the shadow economy every decrease in the official labor force participation. It does not control other variables affecting the fluctuation in the labor force, what makes it a weak indicator of the shadow economy.

4.2.3. Electricity approach:

This methodology was developed in detail by Kaufmann and Kaliberda, 1996.³⁴ Some findings had shown that electricity-overall GDP elasticity is close to one; these authors took this as a basis and suggested that differences between the growth of these two variables, – namely electricity consumption and official GDP, were a good proxy to measure variations in the shadow economy.

Though appealing, the electricity approach has some counterparts. Not all unofficial activities forming part of the shadow economy use electricity. Furthermore, the basis for

this method, that is, the close-to-one electricity-overall GDP elasticity might not be constant across countries or over time.

4.2.4. Currency demand approach (CDA):

This approach assumes that unofficial transactions are carried out in cash and that, therefore, an increase in the estimated size of the shadow economy will lead to a subsequent increase in the demand for cash. This method's counterparts are, for example, that the money demand does not only depend on whether an individual wants or not to leave a trace the transactions for the authorities. Moreover, concluding that the means of payment financing the shadow economy is always cash would underestimate the size of the unofficial sector.

4.2.5. Multiple Indicators, Multiple Causes (MIMIC) approach:

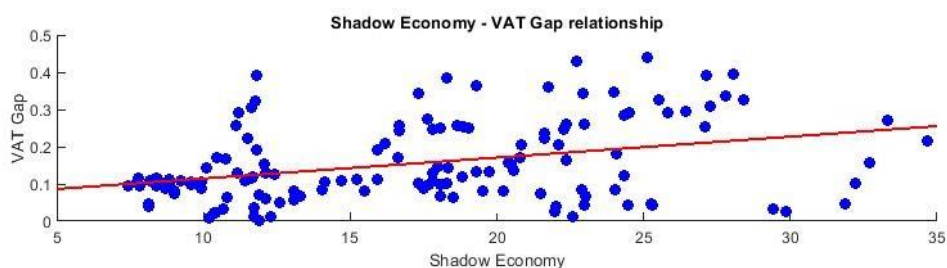
This method takes many causes and effects of the shadow economy. It associates the observable causes and effects of an unobserved variable to estimate the variable itself (Loayza, 1996). It is considered a confirmatory model rather than an explanatory one because it is a theory-based approach useful to confirm the influence exogenous causal variables may have on the dependent variable, as well as the effect of the latest on different macroeconomic indicator variables. Many consider this method the most complex and significant one.

Due to the challenges presented by indirect methods *3.2.1. to 3.2.4.*, when measuring the shadow economy, and for the higher precision of indirect method *3.2.5* for that same purpose, the estimation of the shadow economy's size carried out through a MIMIC Model by Leandro Medina and Friedrich Schneider, 2018, was thought to be the most reliable for this study.

As the VAT Gap stands for the VAT that has not been paid and none of the unofficial transactions forming part of the underground economy pay VAT, an increase in the shadow economy could be expected to affect positively the VAT Gap. See Figure 3.

Core hypothesis H1. A higher level of shadow economy increases the size of the VAT Gap, *ceteris paribus*.

Figure 3. Shadow Economy – VAT Gap relationship, 2012-2016



Source: IMF, own calculations.

4.3 Fiscal decentralization

Fiscal decentralization can be calculated from the International Monetary Fund’s (IMF) Government Finance Statistics (GFS). Those measures contain the degree of expenditure decentralization and tax revenue decentralization that are used in this study. Therein, tax revenue ratio is computed as the share of a given level of government (central, state, province, region, or local) tax revenues to general government tax revenue; and the expenditure decentralization ratio captures the share of expenditures (i.e. the sum of expense and net investment in nonfinancial assets) of the different levels of government as a proportion of overall government spending.

In this study, with the aim of having a variable of fiscal decentralization that embraced both the tax revenue and the expenditure decentralization all together, an average of the two ratios was carried on, as shown in the equation below:

$$FD = \frac{1}{2} \textit{Expenditure decentralization} + \frac{1}{2} \textit{Tax Revenue decentralization}$$

Intuitively, the larger the Decentralization variable’s values, the more independent sub-central governments are in each of the analyzed Member State.

When focusing on decentralization issues, some scholars agree that an economic decentralization does not concede autonomy to sub-central governments if they do not have the competences to decide where to collect from and spend on. For this reason, this study developed an additional variable in order to measure a decentralization that embraced the autonomy of regional governments. To that end, data on Economic Self Rule data was gathered from Jason Sorens’ (2014) the empirical analysis for the 28-Member States and the decentralization variable taken into account before was multiplied by this value:

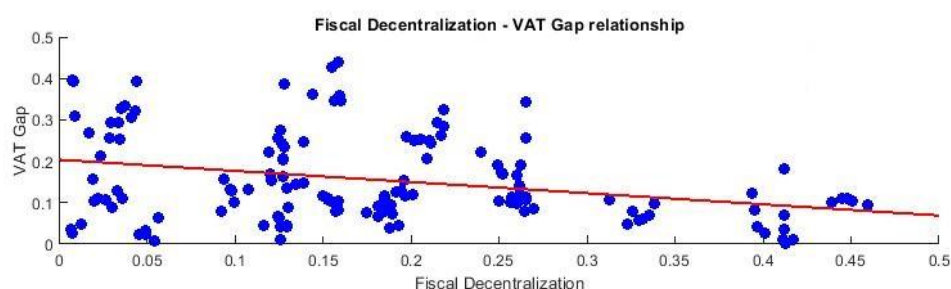
$$FD^{\textit{Self rule}} = FD \times \textit{Self Rule}$$

As explained by other authors (see literature review), the effect of fiscal decentralization is ambiguous because of both its positive and negative effects on the effectiveness of the government. Nevertheless, one could hope that, the positive effects are greater and therefore, that the more fiscally decentralized a country, the smaller the VAT Gap; thus, one could expect for the relationship between the Fiscal Decentralization and the VAT Gap to be negative (See Figure 4). This could apply to both decentralization variables – namely the one that takes account countries’ self-rule into account and the one that focuses on simple fiscal decentralization. The differences in the result of their relations will show whether or not the degree of self-rule affects the VAT Gap.

Core hypothesis H2.1: The higher the Fiscal Decentralization of the Member State, the lower its VAT Gap, *ceteris paribus*.

Core hypothesis H2.2: The higher the Fiscal Decentralization considering the degree of self-rule of the Member State, the lower its VAT Gap, *ceteris paribus*.

Figure 4 Fiscal Decentralization – VAT Gap relationship, 2012-2016



Source: IMF, own calculations

4.4 Tax morale

In the last two waves –namely Wave 5 (2004-2009) and Wave 6 (2010-2014), the World Values Survey has included a question “justifiable to cheat on taxes if you have the chance” with the aim of measuring the tax morale of individuals. Nevertheless, this information is only available for 13-Member States (i.e. Cyprus, Estonia, France, Germany, Hungary, Italy, Netherlands, Poland, Romania, Slovenia, Spain, Sweden, United Kingdom) and does not cover the time period targeted by this study (i.e. 2012-2016). For these reasons, the variable *Tax Morale* will not be taken in the model. Nevertheless, the data has been added to the Appendix, see Table A5, and A6.

Although, *Tax Morale* variable will not be taken into account in this model, one could expect that a higher tax morale would decrease the VAT Gap, *ceteris paribus*, that is, a negative relation between these variables.

4.5 Institutional Quality

As widely done before in the literature, the Quality of Governance (*QoG*) Index will be used in this study as a key proxy for institutional quality (see Kaufmann, Kraay, & Mastruzzi, 2009); concretely, the European Quality of Government Index (EQI).

The EQI index is the result of novel survey data on regional level governance within the 28 members of the EU and two accession countries (Serbia and Turkey) and was first assembled and published in 2010 and subsequently in 2013 and 2017. It focuses on both perceptions towards, and the experiences with the public sector's corruption; and, in addition, to the extent to which residents believe that public services are of good quality and impartially allocated. It is based on the largest regionally-focused survey to date.

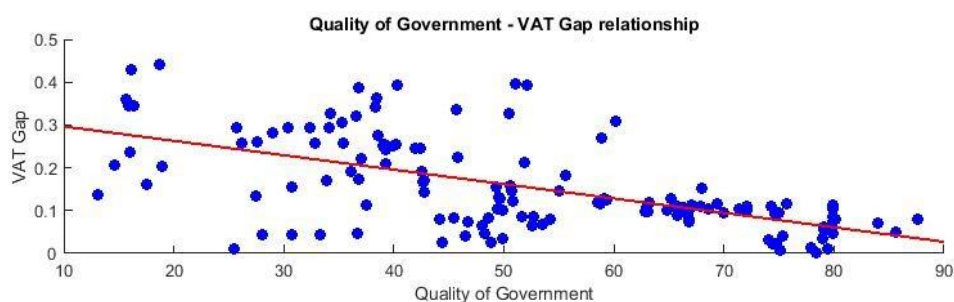
As mentioned above, data are available for years 2010, 2013, and 2017. For the purposes of analyzing what the effect of this variable is in the VAT Gap, data was needed for years 2012-2016 and therefore, the EQI Index provided by the Quality of Government Institute had to be extrapolated.

As commented in the literature review, some scholars argue that, the better the public services match the individual preferences' of citizens, the less incentives will these persons have for acting in the underground economy.

With this in mind, a negative relation could be expected from the variables Institutional Quality and VAT Gap.

Core hypothesis H3: The higher the Institutional Quality, the lower the VAT Gap, *ceteris paribus*.

Figure 5. Quality of Government – VAT relationship



Source: *Quality of Government Institute, own calculations.*

4.6 Missing Trader Fraud

As stated before, this fraud may take different forms and sizes, but the essential issue is indeed the same: no VAT is chargeable on cross-border transactions between the UE-Member States. This enhances the incentives to obtaining profits from avoiding taxation.

In order to control the potential impact the Missing Trader Intra-Community Fraud might have in the VAT Gap, and taking into account the intuition that, more intra-community trade among members might provide a higher likelihood of the fraud to be carried out, a variable called intra-community trade will be essential in this study.

Intra-community trade (*In_Trade*) variable will be defined as the sum of two ratios:

- (i) Ratio of intra-community exports to GDP

$$IX = \frac{\text{Intra - community exports}}{\text{GDP}}$$

- (ii) Ratio of intra-community-imports to GDP

$$IM = \frac{\text{Intra - community imports}}{\text{GDP}}$$

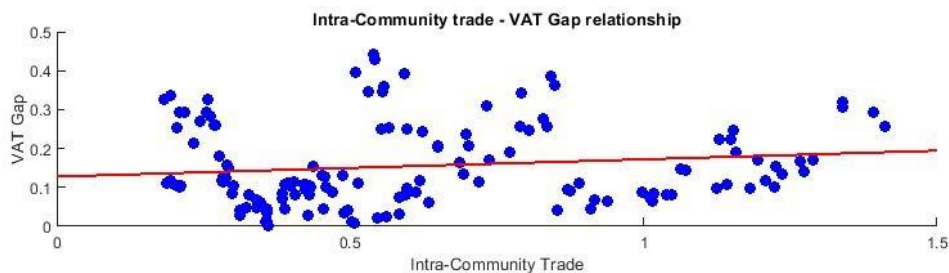
Resulting in:

$$In_Trade = IX + IM$$

Data for the composition of these ratios is available in Eurostat. Intra-community exports and imports in million euros and GDP at market prices.

Core hypothesis H4: The more intra-community trade, the larger the VAT Gap, *ceteris paribus*.

Figure 6. Intra-Community trade – VAT Gap relationship



Source: Eurostat, own calculations

4.7 VAT Standard rate:

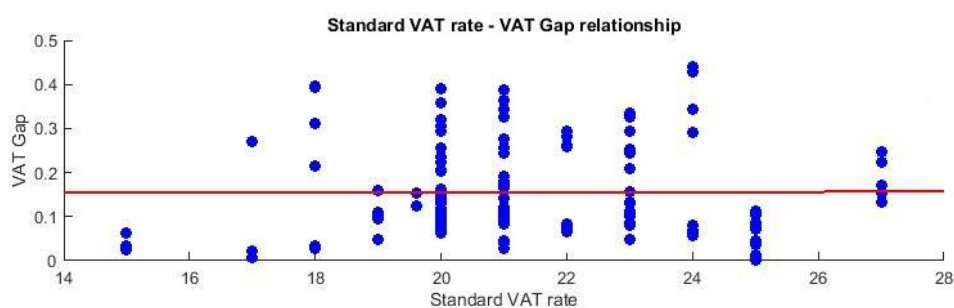
A few countries applied changes to standard VAT rates, but in general, VAT rates were relatively stable in comparison with how variable they were during the Great Recession period in 2008-2009. Nevertheless, any change in countries' VAT rates affects the VTTL and might therefore affect the VAT Gap. This study will focus only on the standard VAT rate as it is the most applicable one.

The variable used for the purpose of capturing the changes in the standard VAT rates during the years in question (*VAT std*) simply contains the different standard rates of those years. The European Commission makes available data on annual VAT standard rates per Member State. Therein, an increasing trend of the rates can be seen for the period in question. Some member states have maintained their rates whereas others have increased it (i.e. Cyprus, Czech Republic, Finland, France, Greece, Hungary, Ireland, Italy, Luxemburg, Slovenia, and Spain).

As for the effect of this variable in the VAT Gap, one could expect that all those contributors that decide not to pay VAT in order to save money will have more reasons to continue to do so in the case of an increasing VAT rate. Therefore, one could *a priori* think of a positive relation between these two variables.

Core hypothesis H5: The greater the VAT Standard Rate, the larger the VAT Gap, *ceteris paribus*.

Figure 7. Standard VAT rate – VAT Gap relationship



Source: European Commission

3.8 Money

As the most valuable bills in the Euro currency, 500 euro-bills undoubtedly attract attention. There is a lot of economic value put in a 160 x 82 mm size, and approximately 2.25 grams-paper which is easy to carry and hide. For this reason and the fact that, as opposed to credit cards, it leaves no trace, it is widely thought to be a usual means of payment in the informal sector of the economy, which contributes to the VAT non-compliance. A negative relation could be expected.

This argument has proved to be motive enough to include in the model a variable that intended to capture the amount of 500 euro-bills owned by each European Member State's citizens in the years 2012-2016.

Regarding the source of the data for this variable, the European Central Bank (ECB) publishes statistical data on outstanding amounts (stocks) of euro banknotes and coins in circulation. Information on the annual amount of 500 euro-bills was obtained from there. Nevertheless, ECB data does not provide for the annual per-member amount of 500 euro-bills and, therefore, some adjustments were made to get the estimation of that information: the total amount of annual 500 euro-bills corresponding to each member state was assessed by taking their share on the overall GDP and on total EU population into account:

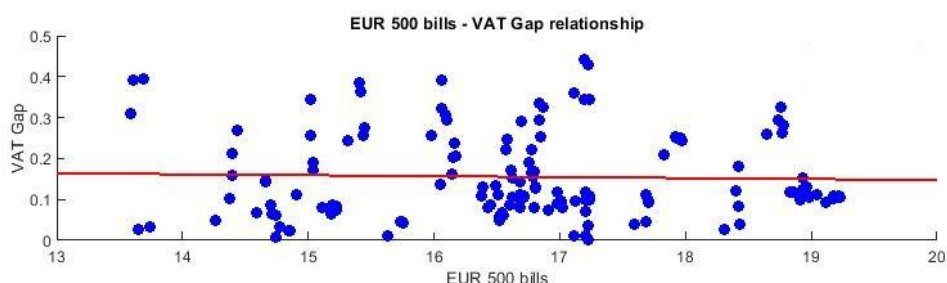
$$MONEY_i = \frac{GDP_i}{GDP_{EU}} + \frac{POP_i}{POP_{EU}} \times EUR500$$

Where $MONEY_i$ stands for the amount of 500-euro bills annually available for each member state.

Mainly for how easily can these 500 euro-bills be manipulated without leaving a trace, it is very likely that those embedded with unofficial transactions that do not pay VAT infringe more the easier their access to these bills. Therefore, one could expect a positive relationship between the amount of 500 euro-bills per country and their VAT Gap; hence, a positive relationship between these variables.

Core hypothesis H6. The more 500 euro-bills available per Member State, the larger its VAT Gap, ceteris paribus.

Figure 8. EUR 500 bills – VAT Gap relationship



Source: ECB, own calculations

Table 3 summarizes the definition of the variables, the expected sign with respect of their relations with the VAT Gap in the European Member States, the hypothesis composed and the sources from where data has been obtained.

Table 3. Definition of the variables and hypotheses.

Definition of the variable	Expected sign	Hypotheses	Source
VAT Gap	/	-	TAXUD
Shadow Economy (SE)	+	H1	IMF
Economic Fiscal Decentralization (FD)	+/-	H2.1	IMF and own elaboration
Self-ruled Fiscal Decentralization (FD _{sr})	+/-	H2.2	IMF and own elaboration
Quality of Government (QoG)	-	H3	The Quality of Government Institute
Intra-community Trade (In_Trade)	+	H4	Eurostat and own elaborations
Standard VAT rates (VAT std)	+	H5	European Commission
Annually available amount of 500 euro-bills (Money)	+	H6	ECB, Eurostat and own elaborations

Table 4. shows the descriptive statistics of the variables used in the panel data of the econometric model. For each variable, its mean, minimum, and maximum values, the standard deviation, and the number of observations are shown. The number of observations correspond in all cases to the 28 European Member States and the years 2012 to 2016.

Table 4. Descriptive statistics of variables of the model.

VARIABLE	MEAN	MAXIMUM	MINIMUM	SD	OBS
VAT Gap	0,1530	0,4409	0,0028	0,1050	140
SE	17,2647	34,6600	7,4100	6,7138	140
VAT standard	21,4800	27,0000	15,0000	2,4402	140
QoG	51,9473	87,6591	13,0950	18,9337	140
Intra IX	0,3004	0,7372	0,0422	0,1948	140
Intra IM	0,3205	0,6731	0,1159	0,1548	140
In_Trade	0,6209	1,4103	0,1833	0,3370	140
FD	0,1799	0,4596	0,0066	0,1180	140
FD _{sr}	2,0522382	14,831836	0	3,86332753	140
Money	41858024	224121218	799012	57784053	140

5 ECONOMETRIC MODEL AND RESULTS

5.1 Econometric model

The goal of this paper is to clear up whether or not shadow economy, different VAT standard rates, Quality of Government, Intra-community Trade, Economic Fiscal Decentralization, Self-ruled Fiscal Decentralization and the amount of 500 euro-bills annually available have an effect on the VAT Gap of European Member States or not, and to estimate to what extent. For this purpose, all regressions carried on include country and year fixed effects to the purpose of having estimates reflect the impact of changes in explanatory variables within a country over time. The endogenous variable runs from 2012 to 2016 for the EU-28 Member States.

Analytically, the basic model to estimate is given by the equation below:

BASIC MODEL (with Self-ruled Fiscal Decentralization):

$$VATGap_i = \beta_0 + \beta_1 QoG_i + \beta_2 SE_i + \beta_3 FD^{s.r}_i + \beta_4 In_trade_i + \beta_5 VATstd_i + \beta_6 Money_i + \epsilon_i$$

Where i indexes the 28-Member States that are to be analyzed, the endogenous variable $VATGap_i$ stands for the difference between the VTTL and the actual VAT revenues as a percentage of VTTL. QoG_i denotes the country's Quality of Government through the normalized EQI, SE_i stands for the Shadow Economy, $FD^{s.r}$ represents the Self-ruled Fiscal Decentralization, In_trade_i is the total intra-community exports and imports all together, $VATstd_i$ is the standard VAT rate for the country, $Money_i$ accounts for the number of 500-euro bills that the state has every year, and finally ϵ_i denotes the error term every of the terms correspond to member i .

The beta coefficients are the estimates of the impact of the analyzed variables on the endogenous variable $VATGap_i$. A linear impact is expected from every of the variables, namely, independence of the value of the variable.

An alteration will be made to the model changing the variable used to represent Fiscal Decentralization, which this time will focus only in the economic perspective of this factor. Namely, FD will be used instead of $FD^{s.r}$. Depending on the outcome of the representativeness of each of the Fiscal Decentralization variables, a conclusion will be

reached on whether or not self-rule conditions the VAT Gap. The other variables will remain the same as before.

BASIC MODEL (with Economic Fiscal Decentralization):

$$VATGap_i = \beta_0 + \beta_1 QoG_i + \beta_2 SE_i + \beta_3 FD_i + \beta_4 In_trade_i + \beta_5 VATstd_i + \beta_6 Money_i + \epsilon_i$$

5.2 Empirical results

The basic model with the Self-ruled Fiscal Decentralization will be first analyzed. Table 5 summarizes the movements that have been made to the variables composing this model after seeing the results that have arose from previous iterations. Numerical results are contained in Table 6.

If we look at the results for Version 1 of the model, it can be seen that, on the one side and consistently with the expectations, the quality of government proxy for Institutional Quality (QoG) exerts a significant negative effect on the VAT Gap: whenever the QoG increases in one percentage point, the VAT Gap decreases in an estimated average of 0.002839 percentage points at 1% significance level. On the other side, and also in line with the expectations, the variable that measures Self-rule Fiscal Decentralization, – namely FD_{SR} – also proves to have a significant negative effect on the dependent variable: whenever it increases in one unit, the VAT Gap decreases by approximately 0.004101 points on average at a 10% significance level. The last variable that appears to be significant according to this model is the variable Money. Whenever the amount of money, which stands for the amount of 500 euro-bills that are in circulation each year for each member state, increases in 1000 million, increases in one unit the VAT Gap increases in an estimated average of 0.317152 percentage points also at a 10% significance level.

The sign of the remaining variables that have been analyzed in this basic model have also shown to be consistent with the hypotheses; nevertheless, this model does not prove a significant effect of these variables on the endogenous VAT Gap variable. Concretely, the shadow economy, represented by the variable SE; the greater likelihood of missing trade fraud, measured by In_Trade; and the changes in the standard VAT rate over the years, represented through variable VAT std, are proved to have a positive effect on the VAT Gap. Therefore, an increase in any of those variables would result in a consequent increase in the VAT Gap. Nevertheless, as stated right before, the results obtained through this model do not prove these effects with a relevant significance level. This could be due to the fact that these variables aim to measure very complex phenomena that may require more

elaborate variables than the ones selected for this model. As the R-squared in this version shows, the 38.94% of the variability of the dependent variable is explained by the regressors.

On the path of trying to find which variables are more decisive, the variable standing for standard VAT rates was eliminated rates because it did not seem to have a compelling effect on variations of the VAT Gap. A potential reason for this result is the fact that almost no variability is provided by this variable. Nevertheless, it was worthy to try.

If we now take a look at Version 2 of the model, which contains the same variables as before with the exception of VAT std, which has been removed, only subtle changes can be appreciated. The main difference relies on the variable Money, which now exerts a greater influence over the dependent variable. Namely for every 1000 million increase in the amount of available 500 EUR bill, the VAT Gap increases an estimated average of 0.646397 percentage points at the same significance level as before, 10%. Although slightly improvement was noticed in the t-probability of both SE and In_Trade, were still not significant for the model. In this case, the R-squared shows that the 38.74% of the variability of the dependent variable is explained by the regressors.

A last trial was carried on in order to see whether or not In_Trade variable could gain power in a version where SE was removed: Version 3 of the model. This trial was not convenient at all because it worsened the results. First of all, no gain of significance was achieved for the variable FD_{SR}. In fact, it lost power. Furthermore, Money variable lost its significance. Regarding QoG, it gained some power. The R-squared in this version shows, the 37.92% of the variability of the dependent variable is explained by the regressors.

Table 5. Movements made to variables of Basic Model (with Self-ruled Fiscal Decentralization)

VARIABLES	MODEL 1	MODEL 2	MODEL 3
Y	x	x	x
C	x	x	x
QoG	x	x	x
SE	x	x	-
FD _{SR}	x	x	x
In_Trade	x	x	x
VAT std	x	-	-
Money	x	x	x

Table 6. Results for Basic Model (with Self-ruled Fiscal Decentralization)

	Version 1	Version 2	Version 3
Independent variables	VAT GAP	VAT Gap	Vat Gap
C	0.286598***	0.234681***	0.316969***
QoG	-0.002839***	-0.002772***	-0.003287***
SE	0.002092	0.002231	-
FD _{SR}	-0.004101*	-0.004271*	-0.003206
In_Trade	0.029460	0.032907	0.011200
VAT std	-0.002002	-	-
Money	0.317152*	0.646397*	0.209789
R-squared	0.3894	0.3874	0.3792

***: p-value < 0.01; **: p-value < 0.05; *: p-value < 0.1

After running Basic Model with Self-ruled Fiscal Decentralization within it, the model with Economic Fiscal Decentralization was run. The aim of this alteration was to see the effect of Economic Fiscal Decentralization on the dependent variable instead of Self-ruled Fiscal Decentralization's. Hence, one variable was exchanged for the other. The expectations were that both variables had a negative effect on the VAT Gap, that is, that higher Fiscal Decentralization of any of the two kinds would decrease the gap. Apart from that, depending on the results provided by the two models, one could compare them and tell whether economic self-rule mattered for the VAT Gap or not. In the same way as with the original model, movements made to variables of the alteration are contained on a table, namely Table 7, and the numerical results on another one, namely Table 8.

In the first version of Basic Model with Economic Fiscal Decentralization, limelight goes to the same variables as before: QoG, FD, and Money. When economic self-rule is not taken into account, the results on how QoG and Money affect the VAT Gap barely suffer changes with respect to version 1 of the original model. The impressive change is perceived when checking the effects economic Fiscal Decentralization have on the dependent variable. In this version, when FD increases in one unit, VAT Gap decreases on an estimated average of 0.163953 percentage points with a significance level of 5%. The improvement is quite considerable if compared to previous results where the percentage increase in VAT Gap for each unit decrease in FD_{SR} was of an estimated average of 0.004101 and at a 10% significance level. There is an estimated difference of 0.159852. Regarding the remaining variables, SE, In_Trade and VAT std remained insignificant for the purpose of finding out the factors affecting the amount of VAT Gap. As the R-squared in this version shows, the 39.52% of the variability of the dependent variable is explained

by the regressors, which is more than the 38.94% explained when Self-ruled Fiscal Decentralization was taken into account.

Next, and for the same reason as before, VAT std was removed from the model and thus, the second version of this model configured. This version showed further improvements. While no general changes could be noticed in almost any variable, Money gained significance. Now, an increase of 1000 million of 500 EUR bills would increase the VAT Gap in an estimated average of 0.305976 percentage points at a 5% significance level. The other variables appeared to have no changes. As for how much variability of the dependent variable is explained by the regressors introduced in this version, it amounts to the 39.52%, the same as in the previous version and again more than in the model with Self-ruled Fiscal Decentralization.

Finally, also for the same reason as before, SE variable was removed from the version. This way, version 3 of the model was carried on. Results showed that the variable Money lost power when SE was taken away from the configuration. An increase of 1000 million of 500 EUR bills would now increase the VAT Gap in an estimated average of only 0.262511 percentage points at a 10% significance level, approximately 0.043465 percentage points less than before. The other variables appeared to have no changes. The R-squared in this version shows a slight decrease on how much variability of the dependent variable is explained by the regressors included here, namely the 39.33%.

Table 7 Movements made to variables of Basic Model (with Economic Fiscal Decentralization)

VARIABLES	MODEL 1	MODEL 2	MODEL 3
Y	x	x	x
C	x	x	x
QoG	x	x	x
SE	x	x	-
FD	x	x	x
In_Trade	x	x	x
VAT std	x	-	-
Money	x	x	x

Table 8. Results for Basic Model (with Economic Fiscal Decentralization)

	Version 1	Version 2	Version 3
Independent variables	VAT GAP	VAT Gap	Vat Gap
C	0.286112***	0.288642***	0.325004***
QoG	-0.002886***	-0.002890***	-0.003104***
SE	0.001009	0.001005	-
FD	-0.163953**	-0.162988**	-0.164985**
In_Trade	0.025949	0.025759	0.016557
VAT std	0.000103	-	-
Money	0.307988*	0.305976**	0.262511*
R-squared	0.3952	0.3952	0.3933

***: p-value < 0.01; **: p-value < 0.05; *: p-value < 0.1

In Table 9, the five top and bottom countries and their average values in the most significant variables are shown. The ranking is done according to how likely those values are to decrease the VAT Gap. Thus, top values correspond to values more likely to be linked to lower VAT gaps. In the case of Quality of Government and Fiscal Decentralization, that corresponds to larger values whereas in the case of Money corresponds to lower values. As can be intuitively seen, European Member States are not homogeneous in the variables analyzed in this study; thus, their attention should be focused aspects, according to their own circumstances in order to improve their VAT Gap levels. From the point of view of the results of this study, countries such as Cyprus and Malta have undesirable levels of Economic Fiscal Decentralization whereas their levels of Money are the most convenient in order to have a smaller VAT Gap; the example of Spain and Germany is the opposite, while having a desirable level of Economic Fiscal Decentralization, they has a disadvantageous level of Money. Again, these terms are coined taking only their relation with the VAT Gap into account. This evidences that whereas for some country efforts should be addressed to improving the level of Economic Fiscal Decentralization, for others it should be addressed to control for the level of Money. In the case of Quality of Government, countries to which the better values correspond are not contained in any of the worse values of the other variables.

Table 9. Five top and bottom values for most significant variables.

QoG		FD		Money	
TOP FIVE					
Denmark	81,47	Germany	0,449	Malta	854,732
Finland	80,80	Sweden	0,413	Cyprus	1,747,218
Sweden	79,71	Spain	0,400	Estonia	2,342,789
Netherlands	75,81	Finland	0,329	Luxembourg	2,659,446
Luxembourg	75,49	Belgium	0,286	Latvia	3,291,561
BOTTOM FIVE					
Hungary	34,30	Slovakia	0,037	Spain	97,672,789
Croatia	30,84	Greece	0,035	Italy	137,317,566
Italy	29,44	Ireland	0,030	France	165,468,997
Romania	16,55	Cyprus	0,019	UK	169,084,567
Bulgaria	16,04	Malta	0,008	Germany	215,225,553

Source: own elaboration.

6. CONCLUSION

VAT system, as Keen and Lockwood said in 2006, is a “money machine”. It earned this name due to how comfortably and easily it raised funds for the public sector. It has become essential in today’s societies which finance their welfare systems through taxes. Thus, well care must to be taken of it. VAT noncompliance is an eminent threat for current societies whose capability of supplying public goods and services depends on VAT to linger, and as such menace, an effort shall be made to mitigate it. VAT Gap has been proved itself useful to represent part of such noncompliance, many times in relative terms (as a share of the VTTL); hence the increasing interest for accurately knowing its size and determinant factors. To the end of throwing some light at this matter, the European Commission tasks a yearly study that, since 2018 also includes an econometric model that aims to find out what affect such gap.

This paper tried to find out whether or not Fiscal Decentralization, institutional quality, the amount of 500 EUR bills annually available, the Shadow Economy, the intra-Community trade, or the VAT standard rates’ level of European Member States were relevant factors to the VAT Gap or not. The targeted period was from 2012 to 2016. The empirical results showed to be in line with the expectations suggested (see Table 3).

Contributions of this paper are the following. First, Fiscal Decentralization appears to decrease the VAT Gap. Both when the economic self-rule is taken into account and when it is not. Nevertheless, only when Economic Fiscal Decentralization is taken into account,

this decrease is significant. That is, economic self-rule does not make an impact on the VAT Gap. In fact, when Fiscal Decentralization takes this aspect into account, its power in determining the dependent variable diminished. Therefore, other aspects of fiscal decentralization might be more important when it comes to impacting the VAT Gap.

Second, higher institutional quality is found to negatively affect the VAT Gap in a significant way. Its impact remained quite unchanged along the three versions of each of the models. Third, the higher the amount of 500 EUR bills annually available was, the larger was the increase in the gap other things being equal.

Sadly, the remaining variables – SE, In_Trade, VAT std –, although in line with the expectations proposed, as could be seen in the results did not appear to determine significantly the VAT non-compliance in this model. In any case, it is essential to bear in mind that had the panel been larger or the information of the variables more complete, the results could have been different.

Apart from that, it has been seen that size of VAT Gaps varies meaningfully across European Member States. This must surely have something to do with the considerable economic and social differences that characterize each member in the European Union and undoubtedly will condition the policies each country chooses to diminish them. A harmonized European policy might be inefficient because, optimal policies in order to diminish VAT non-compliance would probably be dissimilar one another, depending on the just mentioned conditions. As has been shown through Table 9, each Member State has its own circumstances and different aspects weaken their ability to fight for a lower VAT Gap, what implies that different measures shall be taken in order to improve their frailties.

In terms of policies, the level of 500 euro bills available annually can be reduced as it has been done lately, by decreasing the availability of those bills in favor of smaller ones. This way, more bills and space is required to have the same value and it is more difficult to manage informally. Another way is to enhance the use of credit cards, which due to the fact that they leave a trace, they do not thrill non-compliers. Regarding Quality of Government, any policy that improves the different pillars composing this index – the Rule of Law, the Government Effectiveness, the Control of Corruption, and Voice & Accountability – would improve QoG levels. In countries as in Spain, where the problem of corruption is overwhelming, economic resources destined to the improvement of its control and punishment, and to education so that the moral cost of being corrupt increases, would undoubtedly boost the QoG level and consequently decrease the VAT Gap.

Finally, although some of the variables analyzed in this study have proved to be determinant of the VAT Gap, they have not proved to be totally explicative of the dependent variable. Therefore, further research is necessary to assess which are the variables that more accurately determine the VAT Gap so that more accurate policies can be drawn up to avoid the VAT revenues' drain that arises as a consequence of this phenomenon.

BIBLIOGRAPHY

- Allingham, M. G. and A. Sandmo (1972).** “Income Tax Evasion: A Theoretical Analysis”. *Journal of Public Economics* 1(3-4), 323-338.
- Alm, J. and B. Torgler (2006).** “Culture Differences and Tax Morale in the United States and in Europe”. *Journal of Economic Psychology* 27, 224–246.
- Alm, J., E., Kirchler, S., Muehlbacher, K., Gangl, E., Hofmann, C., Kogler, and M. Pollai (2012).** *Rethinking the Research Paradigms for Analysing Tax Compliance Behaviour*. CESifo Forum.
- Alm, James and McClellan, Chandler (2012).** “Tax Morale and Tax Compliance from the Firm’s Perspective”. *Kyklos* 65(1), 1-17.
- Barbone, L., Belkindas, M., Bettendorf L., Bird R., Bonch-Osmolovskiy, M., Smart, M. (2013).** *Study to quantify and analyse the VAT Gap in the EU-27 Member States, Final Report of project*. TAXUD/2012/DE/316.
- Barbone, L., Bonch-Osmolovskiy, M., Poniatowski, G. (2014).** *2012 Update Report to the Study to quantify and analyse the VAT Gap in the EU-27 Member States, Report of project*. TAXUD/2013/DE/321
- Barbone, L., Bonch-Osmolovskiy, M., Poniatowski, G. (2015).** *2013 Update Report to the Study to quantify and analyse the VAT Gap in the EU Member States, Report of project*. TAXUD/2013/DE/321.
- Barone, Gulielmo and Mocetti, Sauro (2011).** “Tax morale and public spending inefficiency”. *International Taxation Public Finance* 18, 724-749.
- Becker, G.S. (1968).** “Crime and Punishment: An Economic Approach”. *The Journal of Political Economy* 76, 169–217.
- Bird, R., J. Martinez-Vazquez and B. Torgler (2006).** “Societal Institutions and Tax Effort in Developing Countries”, in: J. Alm, J. Martinez-Vazquez and M. Rider (eds.), *The Challenges of Tax Reform in the Global Economy*. New York: *Springer*, 283-338.
- Torgler, B., and F., Schneider (2017).** *The Impact of Tax Morale and Institutional Quality on the Shadow Economy*. IZA, No 2541.
- Braithwaite, Valerie and Ahmed, Eliza (2005).** “A threat to tax morale: The case of Australian higher education policy”. *Journal of Economic Psychology* 25, 523-540.
- Buehn, A., C., Lessmann, and G. Markwardt (2011).** *Decentralization and the Shadow Economy: Oates Meets Allingham-Sandmo*. CESifo WP No. 3551.

- Charron, N., L., Dijkstra, V., Lapuente (2010).** *Mapping Quality of Government in the European Union: A Study of National and Sub-National Variation*. QoG Working Paper Series, No 22.
- Charron, N., L., Dijkstra, V., Lapuente (2014).** “Regional Governance Matters: Quality of Government within European Union Member States, *Regional Studies*” 48 (1), 68-90.
- Charron, N., L., Dijkstra, V., Lapuente (2015).** *Mapping the regional divide in Europe: A measure for assessing quality of government in 206 European regions*. *Social Indicators Research*. 122(2), 315-346.
- Dell’Anno, Roberto (2009).** “Tax evasion, tax morale and policy maker’s effectiveness”, *The Journal of Socio-Economics* 38, 988-997.
- Doerrenberg, P., and A., Peichl (2017).** *Tax morale and the role of social norms and reciprocity* Ifo WP, No. 242.
- Feld, Lars P. and Frey, Bruno S (2002).** “Trust breeds trust: how taxpayers are treated”. *Economics of Governance* 2, 87-99.
- Frey, Bruno S. (1994).** “Tertium Datur: Pricing, Regulating, and Intrinsic Motivation”. *Kyklos* 45(2), 161–184.
- Frey, Bruno S. (1997).** “A Constitution for Knaves Crowds Out Civic Virtues”. *The Economic Journal* 107(443), 1043–1053.
- Kaufmann, D. and A. Kaliberda (1996).** “Integrating the unofficial economy into the dynamics of post socialist economies: a framework of analyses and evidence, in: Kaminski”. B. (ed.), *Economic Transition in Russia and the New States of Eurasia* M.E. Sharpe, London, 81–120.
- Kaufmann, Daniel, Aart Kraay and Massimo Mastruzzi (2009).** *Governance Matters VIII: Aggregate and Individual Governance Indicators for 1996-2008*. World Bank Policy Research Working Paper No. 4978. Washington, D.C.
- Keen, M., B. Lockwood (2006).** “Is the VAT a Money Machine?”. *National Tax Journal* 59, 905-928.
- Lledó, V., C., Ncuti, M., Kabanda, C., Hu, and Y., Xiang (2018).** *The IMF Fiscal Decentralization Dataset: A Primer*. IMF.
- Loayza, N. V. (1996).** “The economics of the informal sector: a simple model and some empirical evidence from Latin America”. *Carnegie-Rochester Conference Series on Public Policy* 45, 129–162.
- Medina, L., and F., Schneider (2018).** *Shadow Economies Around the World: What Did We Learn Over the Last 20 Years?*. IMF WP 18/17.

- Oates, Wallace E. (1972).** *Fiscal Federalism*. New York: Harcourt Brace Jovanovich.
- Orviska, Marta J. and Hudson, John (2002).** “Tax evasion, civic duty and the law abiding citizen”. *European Journal of Political Economy* 19, 83-102.
- Pommerehne, Werner W., Hart, Albert and Frey, Bruno S. (1994).** “Tax morale, tax evasion and the choice of policy instruments in different political systems”. *Public Finance* 49, 52-69.
- Poniatowski, G., Bonch-Osmolovskiy, M., Belkindas, M. (2016).** *2014 Update Report to the Study to quantify and analyse the VAT Gap in the EU Member States*. Report of project TAXUD/2015/CC/131.
- Poniatowski, G., Bonch-Osmolovskiy, M., Belkindas, M. (2017).** *2015 Update Report to the Study to quantify and analyse the VAT Gap in the EU Member States*. Report of project TAXUD/2015/CC/131.
- Poniatowski, G., Bonch-Osmolovskiy, M., Durán-Cabré J.M., Smietanka, A. (2018).** *2016 Update Report to the Study to quantify and analyse the VAT Gap in the EU Member States*. Report of project TAXUD/2015/CC/131.
- Prud’homme, Remy. 1995.** “On the Dangers of Decentralization,” *World Bank Research Observer*, 10, 2, .201-20.
- Rothstein, Bo and Teorell, Jan. 2008.** “What Is Quality of Government? A Theory of Impartial Government Institutions.” *Governance: An International Journal of Policy, Administration and Institutions* 21(2):165-190.
- Schmölders, Günter (1960).** *Das Irrationale in der öffentlichen Finanzwirtschaft*. Suhrkamp,
- Schneider, F. (2005).** *Shadow Economies of 145 Countries All Over the World: What Do We Really Know?*. CREMA Working Paper 2006-01, Basel, Center for Research in Economics, Management and the Arts.
- Schneider, F. and A. Buehn (2012).** *Shadow Economies in Highly Developed OECD Countries: What Are the Driving Forces?*, IZA Discussion Paper no. 6891.
- Song, Y. and Y. E. Yarbrough (1978).** “Tax Ethics and Taxpayer Attitudes: A Survey”. *Public Administration Review*. 38: 442-457.
- Sorens. J. (2014).** "Does Fiscal Federalism Promote Regional Inequality? An Empirical Analysis of the OECD, 1980-2005". *Regional Studies* 48 (2): 239-53.
- Spicer, M. W. and S. B. Lundstedt (1976).** “Understanding Tax Evasion”. *Public Finance*. 31: 295-304.
- Srinivasan, T.N. (1973).** “Tax Evasion: A model”, *Journal of Public Economics* 2, 339–346.

Torgler, B., F. Schneider, and C. Schaltegger (2010). “Local autonomy, tax morale, and the shadow economy”. *Public Choice*, 144(1), 293-321.

Torgler, Beno, Demir, Ihsan C., Macintyre, Alison and Schaffner, Markus (2008). “Causes and Consequences of Tax Morale: An Empirical Investigation”. *Economic Analysis & Policy* 38(2), 313-339.

Webley, P., P. Robben, H. Elffers and D. Hessing (1991). *Tax Evasion: An Experimental Approach*. Cambridge: Cambridge University Press.

Werner, G., M.V., Levati, and R., Sausgruber (2005). *Tax morale and (de-) centralization: An experimental study*. *Public Choice*. 125. 171-188. 10.1007/s11127-005-3414-7.

WEBGRAPHY

Marius-Cristian Frunza (2016). Cost of the MTIC VAT fraud for European Union members. Apa Style. (01/05/2019),

https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2758566.

[General info]. (n.d.). (12/03/2019) https://en.wikipedia.org/wiki/Value-added_tax.

[Tax morale].(n.d.). (04/03/2019).<http://www.worldvaluessurvey.org/WVSDocumentationWV5.jsp>.

[IVAeuropa]. (n.d.). (20/03/2019) <https://www.ivaeuropa.es/tipos-de-iva-aplicables-para-2018-en-la-ue/>

MTIC (Missing Trader Intra Community fraud). (n.d.). (01/05/2019) <https://www.europol.europa.eu/crime-areas-and-trends/crime-areas/economic-crime/mtic-missing-trader-intra-community-fraud>.

QoG. (n.d.). (20/03/2019) <https://qog.pol.gu.se/data/datadownloads/qog-eqi-data>

[VAT rates' evolution.] (n.d.). (28/02019) https://ec.europa.eu/taxation_customs/taxation_en.

APPENDIX

TABLE A.1. VAT Gap estimates, 2012 (EUR million)

Countries	Codes	Revenues	VTTL	VAT Gap	VAT Gap (%)
Belgium	BE	26896	29887	2991	10,01%
Bulgaria	BG	3739	4697	958	20,40%
Czech Republic	CZ	11377	14644	3267	22,31%
Denmark	DK	24422	26563	2141	8,06%
Germany	DE	194040	215997	21957	10,17%
Estonia	EE	1508	1763	255	14,46%
Ireland	IE	10219	11482	1263	11,00%
Greece	EL	13713	20364	6651	32,66%
Spain	ES	56125	68537	12412	18,11%
France	FR	142499	168082	25583	15,22%
Croatia	HR	-	-	-	-
Italy	IT	95473	141507	46034	32,53%
Cyprus	CY	-	-	-	-
Latvia	LV	1570	2389	819	34,28%
Lithuania	LT	2521	3957	1436	36,29%
Luxemburg	LU	3064	3268	204	6,24%
Hungary	HU	9084	12055	2971	24,65%
Malta	MT	536	777	241	31,02%
Netherlands	NL	41699	43699	2000	4,58%
Austria	AT	24563	27807	3244	11,67%
Poland	PL	27881	37198	9317	25,05%
Portugal	PT	13995	15223	1228	8,07%
Romania	RO	11212	20053	8841	44,09%
Slovenia	SI	2889	3160	271	8,58%
Slovakia	SK	4328	7114	2786	39,16%
Finland	FI	17640	18545	905	4,88%
Sweden	SE	37861	40748	2887	7,09%
United Kingdom	UK	142943	159501	16558	10,38%

Source: TAXUD/2013/CC/321;

Shows data on the revenues, the VTTL, and the VAT Gap in million euros and the VAT Gap expressed as a percentage of the VTTL for year 2012.

*VAT Gap (%) stands for the VAT Gap in terms as a share of VTTL.

TABLE A.2. VAT Gap estimates, 2013 (EUR million)

Countries	Codes	Revenues	VTTL	VAT Gap	VAT Gap (%)*
Belgium	BE	27250	30923	3673	11,88%
Bulgaria	BG	3898	4653	755	16,23%
Czech Republic	CZ	11694	14455	2761	19,10%
Denmark	DK	24321	27409	3088	11,27%
Germany	DE	197005	221107	24102	10,90%
Estonia	EE	1558	1826	268	14,67%
Ireland	IE	10372	11913	1541	12,94%
Greece	EL	12593	18940	6347	33,51%
Spain	ES	61126	69589	8463	12,16%
France	FR	144301	164791	20490	12,43%
Croatia	HR	-	-	-	-
Italy	IT	93921	132796	38875	29,27%
Cyprus	CY	-	-	-	-
Latvia	LV	1690	2275	584	25,69%
Lithuania	LT	2611	4253	1642	38,61%
Luxemburg	LU	3415	3532	116	3,29%
Hungary	HU	9073	11668	2595	22,24%
Malta	MT	582	958	375	39,20%
Netherlands	NL	42424	47731	5307	11,12%
Austria	AT	24953	27399	2446	8,93%
Poland	PL	27780	37227	9447	25,38%
Portugal	PT	13710	16236	2526	15,56%
Romania	RO	11913	18186	6272	34,49%
Slovenia	SI	3045	3260	214	6,57%
Slovakia	SK	4696	6914	2218	32,08%
Finland	FI	18888	20028	1140	5,69%
Sweden	SE	39048	39540	492	1,24%

United Kingdom	UK	142227	157932	15705	9,94%
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Source: TAXUD/2015/CC/131;

Shows data on the revenues, the VTTL, and the VAT Gap in million euros and the VAT Gap expressed as a percentage of the VTTL for year 2013.

*VAT Gap (%) stands for the VAT Gap in terms as a share of VTTL.

TABLE A.3. VAT Gap estimates, 2014 (EUR million)

Countries	Codes	Revenues	VTTL	VAT Gap	VAT Gap (%)*
Belgium	BE	27518	30496	2978	9,77%
Bulgaria	BG	3810	4986	1176	23,59%
Czech Republic	CZ	11602	13916	2313	16,62%
Denmark	DK	24950	27868	2919	10,47%
Germany	DE	203081	227979	24898	10,92%
Estonia	EE	1711	1874	163	8,70%
Ireland	IE	11521	12628	1106	8,76%
Greece	EL	12676	16966	4290	25,29%
Spain	ES	63643	69400	5757	8,30%
France	FR	148454	170435	21981	12,90%
Croatia	HR	5368	5611	243	4,33%
Italy	IT	97071	135376	38305	28,30%
Cyprus	CY	-	-	-	-
Latvia	LV	1787	2207	420	19,03%
Lithuania	LT	2764	3816	1052	27,57%
Luxemburg	LU	3732	3823	90	2,35%
Hungary	HU	9754	11757	2003	17,04%
Malta	MT	642	1063	421	39,60%
Netherlands	NL	42708	47050	4342	9,23%
Austria	AT	25386	28084	2699	9,61%
Poland	PL	29317	39032	9715	24,89%
Portugal	PT	14682	16914	2232	13,20%
Romania	RO	11496	20116	8620	42,85%
Slovenia	SI	3155	3411	256	7,51%
Slovakia	SK	5021	7227	2206	30,52%

Finland	FI	18948	20159	1211	6,01%
Sweden	SE	38846	38956	110	0,28%
United Kingdom	UK	157478	176193	18715	10,62%

Source: TAXUD/2015/CC/131;

*VAT Gap (%) stands for the VAT Gap in terms as a share of VTTL.

Shows data on the revenues, the VTTL, and the VAT Gap in million euros and the VAT Gap expressed as a percentage of the VTTL for year 2014.

TABLE A.4. VAT Gap estimates, 2015 (EUR million)

Countries	Codes	Revenues	VTTL	VAT Gap	VAT Gap (%)*
Belgium	BE	27578	30906	3329,00	10,77%
Bulgaria	BG	4059	5117	1058	20,67%
Czech Republic	CZ	12382	14903	2521	16,92%
Denmark	DK	25493	14903	3054	10,70%
Germany	DE	211616	236322	24706	10,45%
Estonia	EE	1873	1999	127	6,33%
Ireland	IE	11955	13375	1419	10,61%
Greece	EL	12885	18243	5358	29,37%
Spain	ES	68601	71498	2897	4,05%
France	FR	151680	171547	19867	11,58%
Croatia	HR	5690	5941	251	4,22%
Italy	IT	101061	136814	35753	26,13%
Cyprus	CY	1517	1690	174	10,28%
Latvia	LV	1876	2265	389	17,17%
Lithuania	LT	2888	3880	992	25,57%
Luxemburg	LU	3442	3523	80	2,28%
Hungary	HU	10669	12611	1943	15,40%
Malta	MT	684	708	24	3,42%
Netherlands	NL	44879	49584	4705	9,49%
Austria	AT	26247	28529	2282	8,00%
Poland	PL	30075	39727	9652	24,30%

Portugal	PT	15368	17640	2272	12,88%
Romania	RO	12939	19747	6808	34,48%
Slovenia	SI	3218	3507	289	8,24%
Slovakia	SK	5420	7664	2243	29,27%
Finland	FI	18974	20379	1405	6,89%
Sweden	SE	40501	41975	1474	3,51%
United Kingdom	UK	182152	204752	22600	11,04%

Source: TAXUD/2015/CC/131;

*VAT Gap (%) stands for the VAT Gap in terms as a share of VTTL.

Shows data on the revenues, the VTTL, and the VAT Gap in million euros and the VAT Gap expressed as a percentage of the VTTL for year 2015.

TABLE A.5. Answers to “justifiable to cheat on taxes if you have the chance”, Wave 5

	Cypr us	Fran ce	Germ any	Hung ary	Italy	Nethe rlands	Pola nd	Roma nia	Slove nia	Spa in	Swed en	Unite d Kingd om
Never justifiable	58,5	47,8	55,6	58,9	60,9	60,2	52,2	61,6	54,5	63,8	53,1	56,1
2	14	14,6	11,7	14,6	10,1	10,7	11,5	9,6	13	10,3	17,7	12,5
3	9,1	9,7	11,5	10,6	10,1	7	9	4,6	9,4	6,3	11,3	10,3
4	4,6	4,4	7,5	5,3	4,5	4,7	4,9	2,6	4,7	4,1	4,7	3,1
5	4,6	9,3	6,1	4,7	5,3	6,6	8,4	4,3	2,9	6,7	5,1	6,5
6	3,2	3,4	2,7	2,1	3,5	2,9	2,6	1,9	4,7	2,8	2,1	2,4
7	2,1	1,8	1,2	1,8	1,6	2,5	1,5	2	2,4	3,3	1,6	2,4
8	0,9	3,6	0,7	0,4	1,4	1,3	2,5	2,2	1,8	0,5	2,1	1,6
9	0,5	1,4	0,5	0,4	0,4	0,5	1,1	1	1	0,3	0,8	0,8
Always justifiable	2	3,8	0,6	0,4	1,3	2,2	1,3	4,2	1,7	0,3	0,8	1,3
Missing; Not asked by the interviewer	0	0	0	0	0	0,1	0	0	0	0	0	0,6
No answer	0,5	0,2	0,9	0	0,8	0,4	0,1	1,2	1,4	0,4	0,7	1,3
Don't know	0	0	0,9	0,7	0,2	0,9	5	4,8	2,4	1,1	0	1
(N)	1,05	1,001	2,064	1,007	1,012	1,05	1	1,776	1,037	1,2	1,003	1,041
Mean	2,21	2,83	2,200	2,02	2,18	2,3	2,44	2,34	2,37	2,06	2,25	2,28
Standard Deviation	2,03	2,52	1,79	1,66	1,96	2,16	2,15	2,49	2,18	1,82	1,92	2,05
Base mean	1,044	999	2,028	1	1,002	1,035	949	1,668	997	1,181	996	1,011

Source: World Value Survey

TABLE A.6. Answers to “justifiable to cheat on taxes if you have the chance”, Wave 6

	Cyprus	Estonia	Netherlands	Poland	Romania	Slovenia	Spain	Sweden
Never justifiable	73,4	55,3	62,3	52,9	72,2	70,3	67,6	59,9
2	7,7	13,3	12,8	13,1	7,1	12,1	12,1	13,3
3	5,7	10,4	9,4	8,7	4	6,4	7,4	7,6
4	3,8	5,6	3,7	5,7	2	3	4,4	3,5
5	3,9	5,3	4,7	7,9	3,9	1,8	5,3	4,8
6	1,3	2,5	1,8	2,4	1,3	2,7	1,1	2,6
7	1,1	1,7	0,9	2	1	0,9	0,5	1,8
8	0,5	1,3	0,6	1,4	1	0,8	0,2	1,1
9	0,8	1,3	0,2	0,3	1,2	0,1	0	0,5
Always justifiable	0,7	1,3	0,6	1,5	3,9	0,9	0,2	2,1
Missing; Not asked by the interviewer	0	0	0	0	0	0	0	0,2
No answer	0	0,2	0,7	0,7	0,4	0,4	0,2	0,5
Don't know	1,1	1,9	2,2	3,4	2,1	0,7	1,1	2,2
(N)	1	1,533	1,902	966	1,503	1,069	1,189	1,206
Mean	1,77	2,28	1,9	2,34	2,03	1,76	1,73	2,15
Standard Deviation	1,68	2,02	1,61	2,02	2,28	1,62	1,35	2,04
Base mean	990	1,501	1,847	926	1,466	1,058	1,174	1,172

Source: World Value Survey