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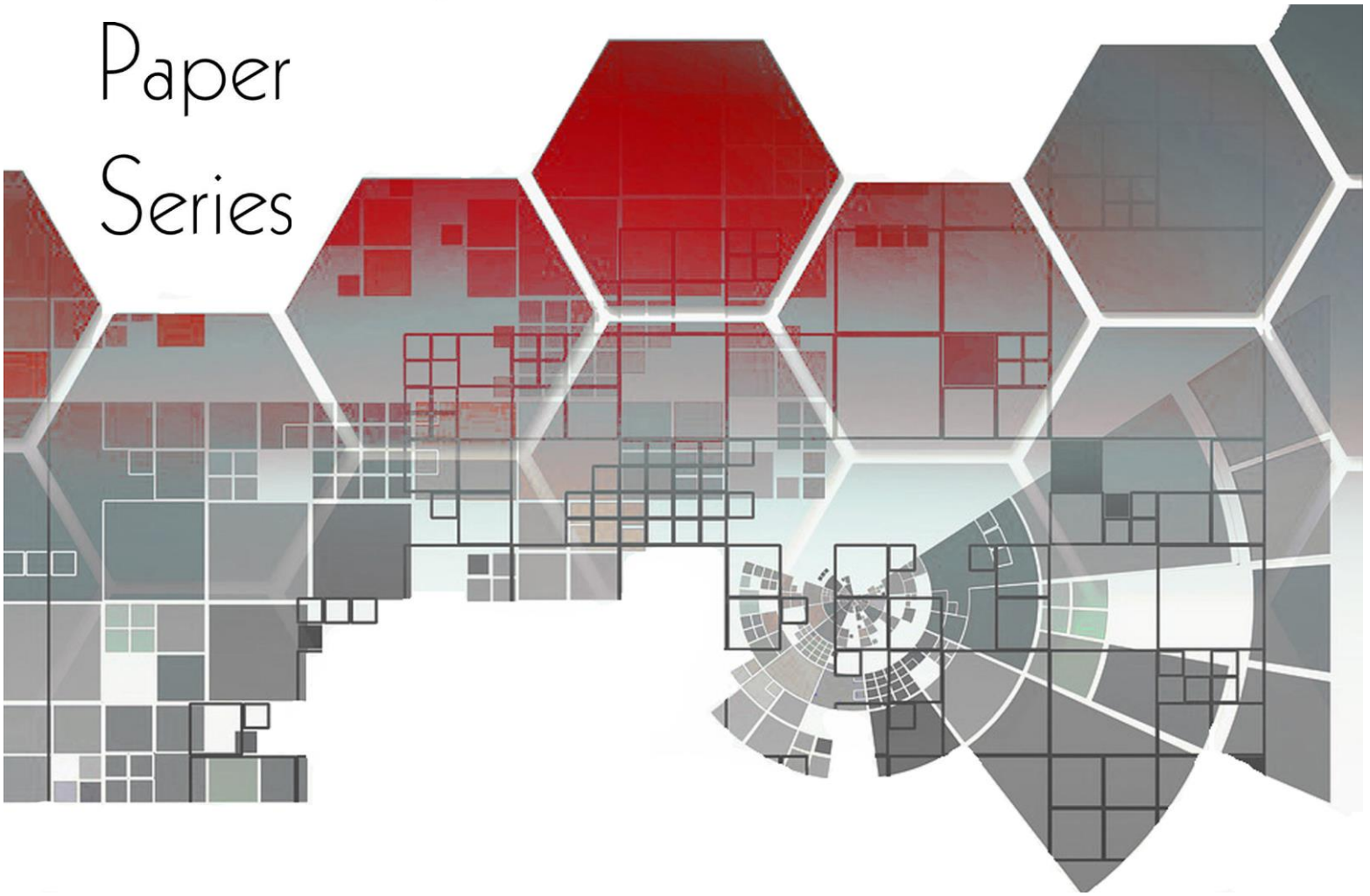

Agnieszka Szczypińska

What drives the VAT gap in the European Union?

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Abstract

The EU Member States face the problem of ineffective tax collection, especially in the case of VAT. It is a challenge to assess the scale of tax evasion which probably explains the lack of data published so far. This paper aims to identify determinants of the VAT gap in the EU Member States based on a panel analysis. Effectiveness of tax system or macroeconomic condition may influence the size of the VAT gap but do not explain this phenomenon comprehensively. The quality of institutions and social trust may also improve the effectiveness of tax collection. On the other hand, factors commonly considered as crucial in the VAT gap analyses did not confirm to be significant in the empirical research, e.g. number of VAT rates or their spread, which indicates no clear justification for the recommendation repeated for years that Poland should limit the use of reduced VAT rates. The in-depth understanding of the VAT gap mechanism allows to use tailored policy measures to restrain the scale of this phenomenon. Systematic data collection, reliable research and interinstitutional cooperation in the area of tax fraud may significantly limit misbehaviours related to the tax law. Moreover, common cashless payments, electronic register of invoices and receipts as well as an increase in transparency of public institutions activities could substantially reduce the scale of the VAT gap.

JEL Classification: C33, H26

Keywords: VAT gap, shadow economy, institutions, tax administration, panel data

* Ministry of Finance in Poland

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1. Introduction

Both developed and developing countries face a problem of VAT gap which is defined as a difference between the expected and actual VAT revenues (European Commission, EC). Consequences of a large VAT gap are severe for public and private sector. The tax gap is a challenge for the sustainability of public finance, both in revenue and expenditure sides. From the perspective of enterprises, unfair competition with firms committing tax evasion distorts the level playing field andmay lead to an elimination of firms obeying the tax rules. Identification of determinants of the VAT gap may allow to create effective tools aiming to restrain this phenomenon. In practice, it means an increase in budget revenues, which can be then redistributed in favour of society and sound business environment. There is a feedback loop between those two dimensions: paying taxes by the entrepreneurs has a positive impact on the budget revenues which help then to satisfy the needs of citizens, including the entrepreneurs.

The aim of this analysis is to identify determinants of the VAT gap in the EU Member States to support the macroeconomic policy. Until 2015 an increase in the VAT gap had been observed and the appropriate measures to address the problem should be chosen based on the results of empirical research. The in-depth understanding of the mechanism of VAT gap formation enables to use tailored policy measures to restrain the scale of this phenomenon. This paper includes the literature review in section 2. Section 3 describes the available data, methodology as well as results and sensitivity analysis. Section 4 summarizes and concludes.

2. Literature review

There is a consensus in the literature on determinants of the VAT gap which might be grouped into three categories: macroeconomic, demographic, institutional and related to the citizens' trust in the state.

Among the macroeconomic and demographic factors of the VAT gap formation, the key role is played by the economic condition described mainly as real GDP level *per capita*, share of shadow economy, openness of the economy as well as population size. The research results point out that more developed countries, with higher level of GDP *per capita*, are

characterised by lower VAT gap (Aizenman, Jinjirak 2008). Unregistered activity within the shadow economy definitely increases the VAT gap scale (HM Customs and Excise 2011, 2012; Zidkova 2014). Challenges related to the assessment of the actual size of shadow economy limit the estimation precision of the potential losses for the budget. The results also indicate a positive impact of the border control on tax payment by the exporters (Aizenman, Jinjirak 2008; Matthews 2003). The size of countries, measured by the number of inhabitants, has a negative influence on the VAT gap (Agha, Haughton 1996; Reckon 2009). This conclusion is based largely on lack of inhabitants' trust that they would actually benefit from the redistribution of budget revenues. Besides, it is a matter of morality and probability of potential punishment – the probability of a control is lower in a large group of tax payers.

In the case of European countries, the size of the VAT gap also depends on the membership in the EU and the euro area (CASE, 2013). The euro area members seem to be more effective in limiting the scale of the VAT gap than the non-euro countries. This is related to a lower level of corruption as well as more effective and transparent public institutions in the common currency area. The dependence between the euro area membership and low VAT gap might be spurious but the quality of institutions definitely lead to restrain the VAT gap scale also outside the euro area what has been proved in the empirical research.

Corruption is closely related to the institutional aspects of the effectiveness of tax collection, including VAT. The Corruption Perception Index published by Transparency International is a commonly used indicator of this factor. It allows to compare the quality of public institutions in particular countries from the perspective of transparency and vulnerability for potential corruption attempts. The perceived tendency to corruption affects the citizens' trust in public institutions which is reflected in the size of the VAT gap. In countries characterised by higher transparency of public institutions the VAT gap is lower (Reckon, 2009). It is worth mentioning that in the case of the euro area members the corruption perception is lower than in other European countries.

Among the institutional determinants of the VAT gap we can distinguish also the characteristics of tax systems like the standard VAT rate or the number of reduced VAT rates (Agha, Haughton 1996; Reckon 2009). In both cases the analyses suggest a positive dependence between the standard VAT rate or the number of reduced VAT rates and the size

of the VAT gap, i.e. the VAT gap is often larger in countries with higher standard VAT rate or larger number of reduced VAT rates. It is a result of the amount of tax revenues and the complexity of tax system. The large number of reduced VAT rates causes problems for tax payers to fill the tax declarations correctly. It may also encourage them to be more creative in terms of products classification based on the height of the VAT rate in order to reduce the tax payments. Scandinavian countries are an exception in this regard because high VAT rates are accompanied by advanced tax morale of the citizens.

Citizens' trust in the state implies an honest relationship between both players. Well-founded social norms related to the tax payment and strong objection against any form of tax evasion contribute to higher effectiveness of tax collection. The feeling of social justice, when citizens benefit from the redistribution of public revenues and do not observe severe inequalities, only boosts that effect. Both high level of social inequalities and at-risk-of-poverty rate lead to an increase in the VAT gap (Christie, Holzner 2006; Reckon, 2009).

In the literature a lot of attention is also paid to the effectiveness of tax administration. Apart from the tax design, like the standard VAT rate or the number of reduced VAT rates, there are other key elements that affect the effectiveness of tax collection: i) administrative costs of tax administration (Agha, Houghton 1996), ii) the socially perceived fairness of the tax system, iii) effectiveness of the legal system and iv) the punishment rate for tax frauds[1] (Christie, Holzer 2006). An increase in the expenditure on tax administation (in relation to net revenues) may contribute to higher effectiveness of tax collection. Highly perceived effectiveness of the tax system as well as effectiveness of the legal system and high punishment rate for tax frauds help to restrain the scale of the VAT gap.

3. Econometric analysis

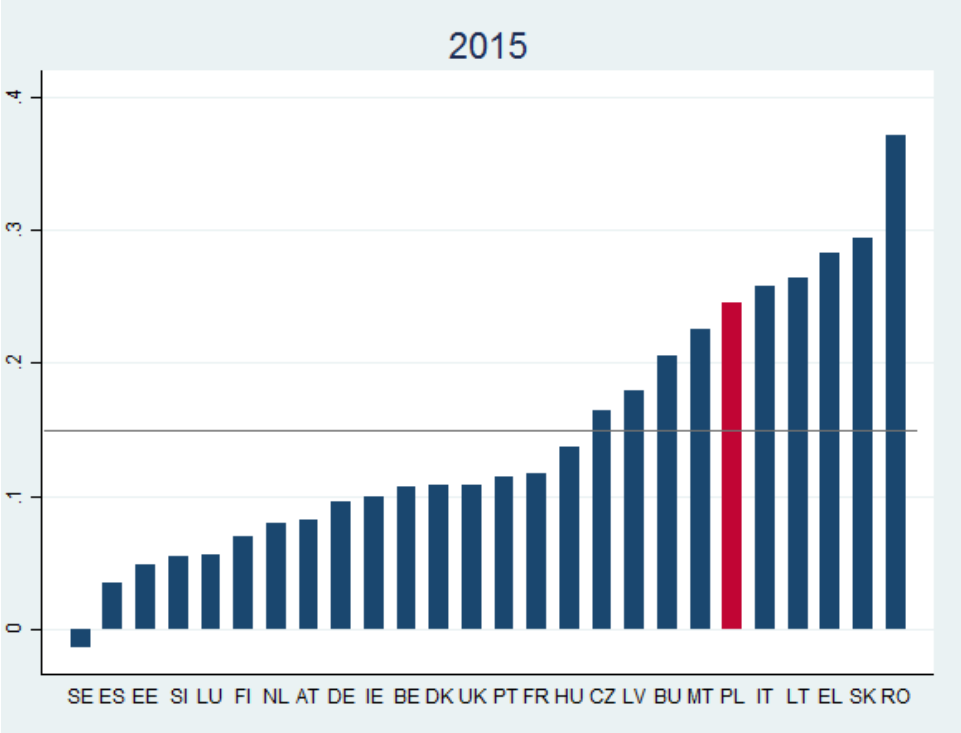
3.1. Data

In this analysis we used data on the VAT gap scale in the EU Member States from the CASE Report (2017) prepared for the EC. Poland is characterised by a relatively high level of the

[1] These indicators are acquired from the *World Value Survey*.

VAT gap, 24.5% of the expected VAT revenues in 2015, exceeding the EU average by 10 percentage points. The dynamics analysis suggests that the problem of the VAT gap formation escalated during the crisis and has not significantly recovered in the aftermath. Determinants of the VAT gap may be thus more rooted in the tax-institutional system whose weaknesses came up during the turbulent times. Recovering from the crisis has not improved the situation significantly which only confirms the conjecture of the long term nature of the VAT gap determinants.

Graph 1. VAT gap level in the EU economies in 2015 (%VTTL)



Source: Based on CASE data

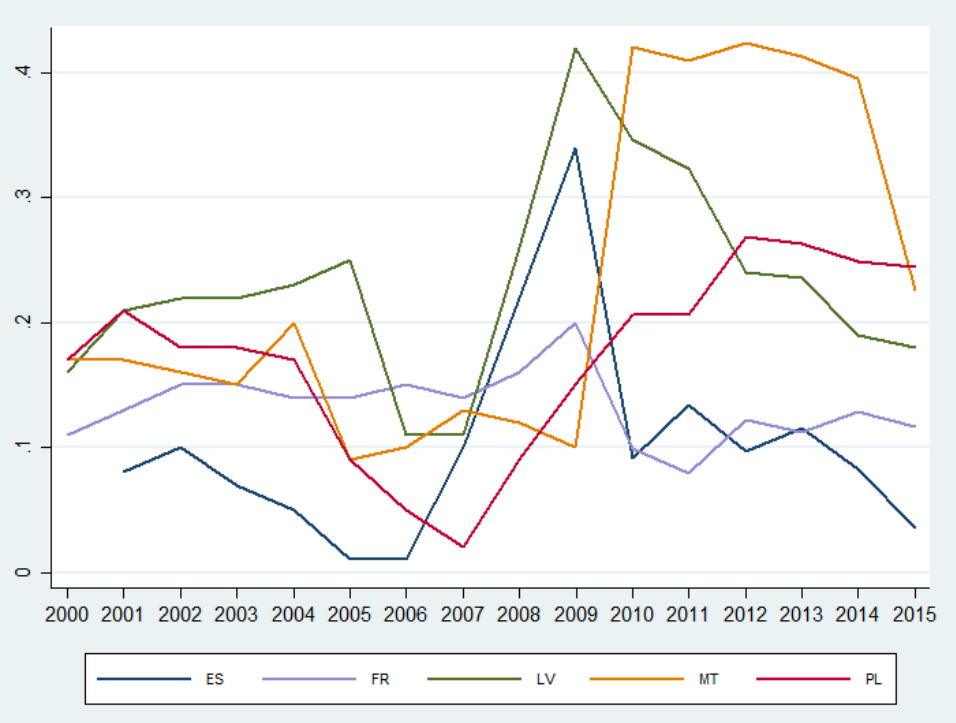
The VAT gap is defined as a difference between the expected (theoretical) and actual VAT revenues, expressed as a share of expected VAT revenues (*VAT Total Tax Liability*, VTTL):

$$VAT\ gap = \frac{expected\ VAT\ revenues - actual\ VAT\ revenues}{expected\ VAT\ revenues} \quad (1)$$

The assessed size of the VAT gap in the following editions of the CASE Report does not seem to be consistent. The values for particular countries and years in the overlapping periods

differ significantly. The analysis of cut-off dates in the consecutive reports indicates structural changes in time series, which are difficult to explain, e.g. Malta (see Graph 2.). Having in mind the methodological inconsistencies between the editions of the CASE Report and different values in the overlapping periods, we decided to use a dataset from one edition only, i.e. 2011-2015 (excluding Cyprus and Croatia). In this case, the analysis results are more reliable thanks to comparable data obtained in a consistent way. Using the assessment of the dependent variable instead of the exact values generates challenges related to the econometric modelling. However, other sources of the VAT gap data in all the EU Member States are not publicly available.

Graph 2. VAT gap level in selected EU economies in 2000-2015 (%VTTL)



Source: Based on CASE data

Based on the literature review we analysed potential explanatory variables, classified into the following categories:

Macroeconomic and demographic factors:

- output gap, % GDP (OECD)
- GDP (Eurostat)

- population size (Eurostat)
- share of shadow economy, % GDP (World Bank)
- Gini index (World Bank)
- share of small firms /1-9 employees/ (OECD)
- trade exchange within/outside the EU, % GDP (Eurostat)
- exports discrepancy, % exports (Comext)
- share of cashless transactions (ECB)

Institutional factors:

- quality of institutions /Corruption Perception Index/ (Transparency International)

Factors related to the design of tax system and its effectiveness:

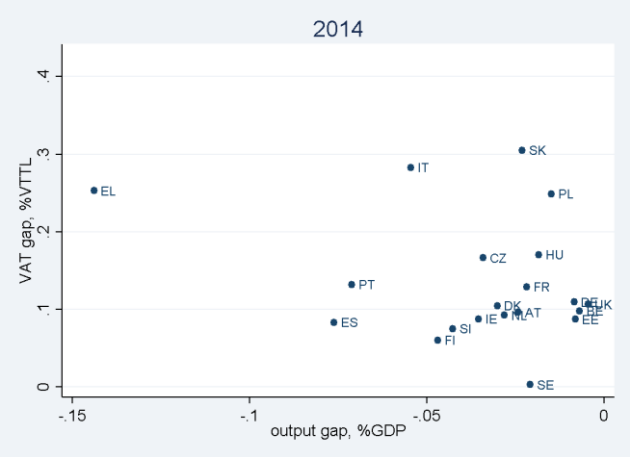
- weighted average VAT rate (CASE)
- standard VAT rate (EC)
- the lowest (non-zero) VAT rate (EC)
- the number of VAT rates (EC)
- spread of VAT rates /difference between the highest and the lowest VAT rate/ (EC)
- collection cost /administrative costs for tax administration in relation to net revenue / (OECD)
- complexity of tax forms /time to prepare and pay taxes in hours/ (World Bank)
- IT expenditure /share of total IT expenditure in total revenue body revenue/ (OECD)
- HR expenditure /share of total human resource management support functions in total expenditure/ (OECD)

The analysis of potential explanatory variables allowed to observe ambiguous, difficult to identify, dependencies between them and the dependent variable. A weak positive relation between the output gap and the VAT gap could be cautiously suggested (see Graph 3.) but other macroeconomic or demographic variables do not represent a high correlation rate with the size of the VAT gap.

The potential impact of the quality and transparency of institutions as well as social trust in the state measured by the Corruption Perception Index (CPI) is more pronounced. Countries

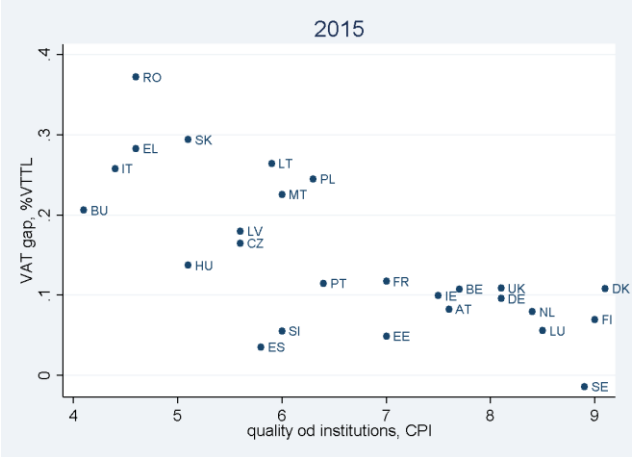
characterised by higher institutional culture report lower level of the VAT gap (see Graph 4.). The perceived tendency to corruption affects the citizens' trust in the tax bodies which contributes to lower VAT gap (Reckon, 2009). This effect is strengthened by the feeling of social justice stemming from the effective redistribution of tax revenues.

Graph 3. Output gap vs. VAT gap in 2014



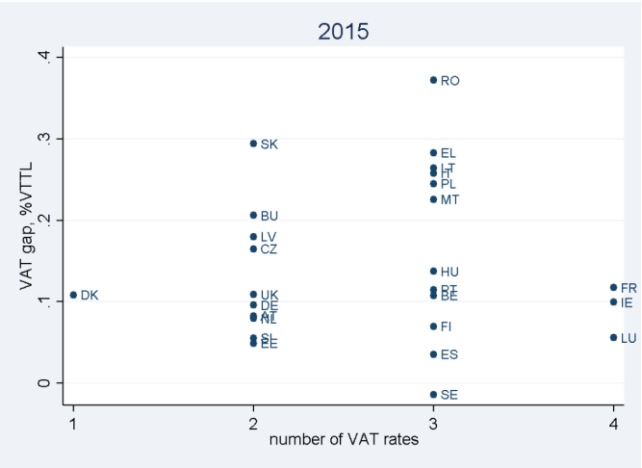
Source: Based on the OECD and CASE data

Graph 4. Quality of institutions vs. VAT gap in 2015



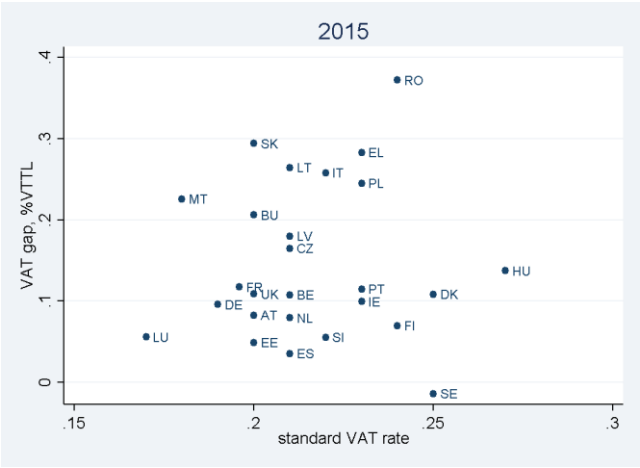
Source: Based on data from Transparency International

Graph 5. Number of VAT rates vs. VAT gap in 2015



Source: Based on data from the European Commission

Graph 6. Standard VAT rate vs. VAT gap in 2015



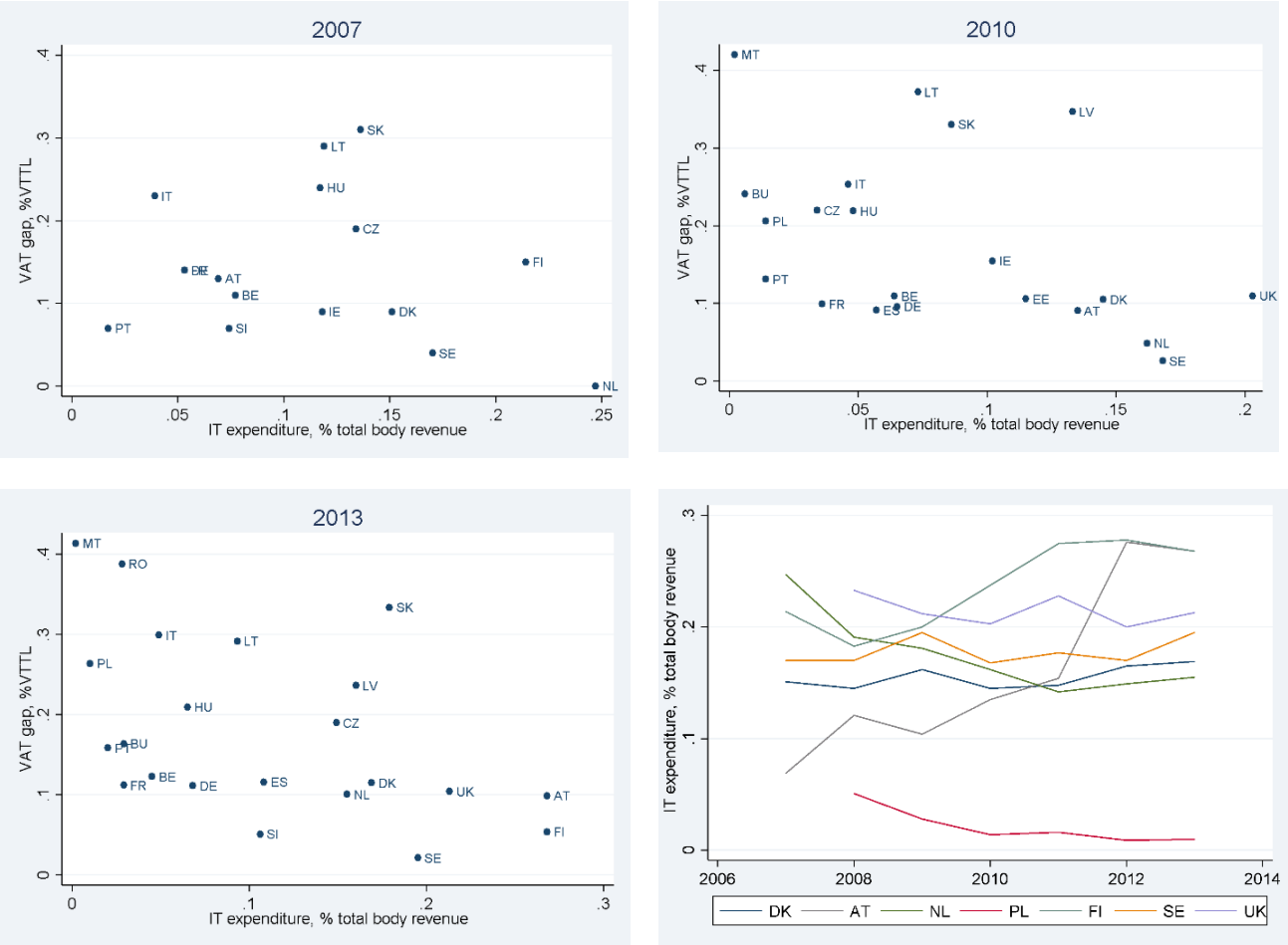
Source: Based on data from the European Commission

No clear relations were observed among the variables describing the design of tax system. The number of VAT rates or the value of standard VAT rate present an ambiguous impact on the VAT gap level. Based on the data from 2015, it is difficult to claim if the number of VAT rates actually influences the VAT gap (see Graph 5.). Apart from the outliers (Denmark and

Luxembourg), which do not suggest either if the lower number of VAT rates is more effective, the rest of countries report very diverse level of the VAT gap regardless of the number of VAT rates. In this context, the regularly repeated Council's recommendation to *limit the use of reduced VAT rates* (The Council of the EU, 2017) is not easy to be justified. A similar conclusion can be formulated for the unclear relations between the value of standard VAT rate and the VAT gap (see Graph 6.).

A more clear negative relation seems to exist between the IT expenditure in tax administration and the size of the VAT gap (see Graph 7.). Investment in IT systems in tax administration improves the quality of data gathering which allows to carry out reliable analyses and in result to identify tax fraudsters more effectively.

Graph 7. IT expenditure in tax administration vs. VAT gap in 2007, 2010, 2013 and 2006-2014



Source: Based on the OECD data

The positive implications of modern IT systems are observed especially in countries characterised by low VAT gap (NL, DK, UK, SE, AT, FI). Those countries bear high costs of IT systems maintenance regularly year by year or systematically raise them (AT). The other countries reporting low VAT gap (ES, SI, DE, BE, FR) do not invest significantly in IT systems, therefore this relation does not seem to be that obvious. Poland, in this respect, lags behind in terms of both the IT expenditure and the size of the VAT gap. Administrative costs of tax administration (Agha, Houghton 1996) and social perception of the tax system's fairness (Christie, Holzer 2006) play an important role in identifying determinants of the VAT gap. An increase in expenditure on tax administration may thus contribute to higher effectiveness of tax collection.

3.2. Methodology

Some of the abovementioned variables are time-invariant (at least in the sample), which limits the range of available econometric methods. The VAT gap phenomenon is dynamic by nature but due to a short sample of data obtained in a consistent way, the appropriate dynamic analysis seems to be challenging. Therefore, having in mind all the limitations, we decided to use the random effects estimator which allows to include the time-invariant variables and explain the influence of differences between countries on the VAT gap level:

$$y_{it} = \mu + \boldsymbol{x}'_{it}\beta + v_{it} \qquad i = 1, \dots, N;\ t = 1, \dots, T$$
$$v_{it} = \alpha_i + \varepsilon_{it}$$

The random variable v_{it} is a sum of random individual effects α_i and white noise ε_{it}. Due to other features of the random effects models, e.g. variance of individual effects not equal to zero, the model is estimated with the use of GLS which is more effective than OLS in this case (Baltagi, 2008).

3.3. *Results*

Carrying out the empirical analysis has been challenging as the sample is not long enough, the quality of data is not fully satisfying and dependencies between the variables have been difficult to identify. In many options of the specification the coefficients were not stable and

their signs were not in line with the economic intuition. Besides, many potential explanatory variables were not statistically significant, especially those describing macroeconomic condition and design of the tax system.

Results of the analysis indicate thus an important role of the quality of institutions and effectiveness of tax administration in explaining the development of VAT gap (see Table 1.). The coefficient of the quality of institutions suggests a decrease in the VAT gap by 0.02 in result of an increase in the Corruption Perception Index by a unit. Design of the tax system, i.e. the standard VAT rate, the number of VAT rates or their spread do not stand as key determinants in explaining the VAT gap phenomenon in the EU Member States. High weighted average VAT rate decreases the effectiveness of VAT collection but the other elements of tax system seem to be statistically insignificant. The results point out that adoption of the Council's recommendation to *limit the use of reduced VAT rates* (The Council of the EU, 2017) may not necessarily lead to a decrease in the VAT gap. The effectiveness of VAT collection is more affected in a positive way by the quality and trust in institutions and investment in IT systems in tax administration which raises the effectiveness of tax collection as well as allows to identify potential tax frauds. The cost of collection seems to be significant too - the negative sign of its coefficient might be interpreted as the positive impact of effective spending on tax administration in order to minimise the scale of the VAT gap.

An adequate quality of institutions and social trust in the state may contribute to higher effectiveness of tax collection. Efficient tax administration characterized by a high level of digitalization and highly qualified personnel may result in minimizing the scale of tax frauds. On the other hand, the determinants of VAT gap described commonly in the literature as crucial in the analyses did not turn out to be significant in the empirical research. It stresses the need for an in-depth understanding of the VAT gap mechanism, which allows to choose the most adequate policy measures to restrain the size of this phenomenon. Systematic data collection, reliable research and interinstitutional cooperation in the area of tax fraud may significantly limit misbehaviours related to the tax law. Moreover, common cashless payments, electronic register of invoices and receipts as well as an increase in transparency of public institutions activities could substantially reduce the scale of the VAT gap in the EU Member States. The analysis of mechanisms building up the shadow economy, whose one of the elements is the VAT gap, indicates a reduction in the passive shadow economy by 0.87%

GDP resulting from the obligatory electronic payments of pensions, wages and salaries. The obligation to operate POS terminals in all sectors where the passive[2] shadow economy has been identified could restrain the scale of shadow economy by additional 0.79% GDP (EY, 2016).

Table 1. Results of estimations

Results of estimations					
	1	**2**	**3**	**4**	**5**
Explanatory variables	**Coefficients**				
standard VAT rate			0.206736	0.2825	
weighted –av. VAT rate	1.81658***	1.3541***			1.33181 **
quality of institutions	-0.018561**	-0.02022***	-0.023449***	0.024293***	-0.0261 ***
IT expenditure	0.369948**	0.394394***	-0.466471***	-0.39334***	0.398613***
HR expenditure	0.856378	0.764943	0.566831		0.196722
the lowest VAT rate	-0.733644				-0.557513
spread of VAT rates	-0.61323		-0.217891	-0.305962	-0.552886
number of VAT rates	0.003309		0.000609	0.026943	0.005222
collection cost					-4.04708***
cons.	0.208475	0.15573	0.352874**	0.288358 **	0.35306 **
R^2 within	0.3064	0.3003	0.2722	0.1406	0.4602
R^2 between	0.6045	0.5752	0.4572	0.5749	0.5870
R^2 overall	0.6218	0.5817	0.4763	0.5654	0.6131

*** p-value<0.01 ** 0.01≤p-value<0.05 * 0.05≤p-value<0.1

Source: Author's estimation (Stata 14)

3.4. *Sensitivity analysis*

Having in mind the limited panel dataset used in this analysis, a complementary sensitivity analysis was carried out, aiming to verify the results stability to a modified sample or

[2]Passive shadow economy relates to the unreported cash transactions that can be beneficial for one side of the transaction only, i.e. the seller. The consumer is passive in this case.

estimation method. The estimation has been repeated based on a cross-country sample for 2013, which is characterized by the lowest share of missing values among the most updated data (see Table 2.).

The conclusions from this exercise are consistent with those obtained in the panel data analysis. The quality of institutions, IT expenditure and highly qualified tax officers are the key factors that may decrease the size of the VAT gap. In addition, the complexity of tax forms and the lowest (non-zero) VAT rate turn out to be statistically significant too. The complexity of tax forms may improve the comprehensiveness of data collection which in turn might increase the effectiveness of tax administration. Higher precision in this aspect may thus result in lower VAT gap. The use of reduced VAT rates may limit the scale of tax evasion especially in the case of low tax burden, e.g. primary goods, which again points out the need to reconsider the Council's recommendation regarding the limited use of reduced VAT rates.

Table 2. Results of sensitivity analysis

Results of sensitivity analysis		
Explanatory variables	**Coefficients**	**Standard Error**
quality od institutions	-0.0833785 ***	0.0110293
IT expenditure	-0.4786322 **	0.1711279
HR expenditure	-1.774017 ***	0.5475973
complexity of tax forms	-0.0010431 ***	0.0001808
the lowest VAT rate	0.5948869 **	0.2524157
cons.	0.9820487 ***	0.100113
R^2	0.8723	
Adjusted R^2	0.8143	
RMSE	0.04138	
F(5, 11)	15.03	
Prob > F	0.0001	

*** p-value<0.01 ** 0.01≤p-value<0.05 * 0.05≤p-value<0,1

Source: Author's estimation (Stata 14)

4. Conclusions

Both developed and developing countries face a problem of the VAT gap. Consequences of this phenomenon are severe for public and private sector which stresses the need for an adequate diagnosis of its determinants as well as effective policy measures to minimise its scale. Restraining the size of the VAT gap results in higher budget revenues but, more importantly, in fair market competition and sound business environment.

According to the literature, the VAT gap sources can be of macroeconomic, demographic or institutional nature but they also relate to the citizens' trust in the state. Based on the panel analysis of the EU Member States (excluding Croatia and Cyprus) in 2011-2015 we found out that:

- design of the tax system, i.e. the number of VAT rates or their spread, is not a key determinant of the VAT gap which suggests that the Council's recommendation to limit the use of reduced VAT rates is quite difficult to justify. The reform of tax system implying lowering of the VAT rates or their spread might not necessarily contibute to a reduction of the VAT gap.

- IT expenditure in tax administration might improve the effectiveness of VAT collection. The attention should be also paid to higher effectiveness of tax administration in the context of reliable data collection allowing for comprehensive analyses whose implementation might increase the detection rate of tax frauds. Countries that invest largely in IT systems in tax administration report low levels of the VAT gap, e.g. Sweden, the Netherlands, Denmark, Great Britain, Austria or Finland.

- the quality and transparency of public institutions induce citizens' trust in the state also regarding the fairness of redistribution which in turn leads to higher effectiveness of tax collection. Countries characterised by high institutional culture do not face severe problems with the VAT gap.

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