



VAT gap determinants in the European Union and Poland

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Abstract

Motivation: VAT revenues constitute a significant part of the budgets of EU countries and Poland. Both the EU and Poland are taking steps to reduce the VAT gap. To define the areas influencing the size of the VAT gap, its determinants should be indicated.

Aim: The study aims to identify the determinants of the VAT gap in the EU and Poland. By comparing the impact of individual determinants on the VAT Gap in the EU and Poland, it will be possible to identify common factors shaping the VAT gap in the EU and Poland.

Results: Based on the econometric study, it was indicated that growth, trade, consumption, and corruption are significant determinants of the VAT gap in the EU and Poland. However, it has been shown that the impact of consumption and corruption on the VAT gap in Poland is different from that in the EU.

Keywords: VAT gap; determinants of the VAT gap; GMM system

JEL: E26; H26; O17; O40

1. Introduction

The VAT gap is understood as the difference between the expected VAT receipts and those paid. VAT revenues often account for a significant proportion of EU countries' budgets. There are relatively few analyzes of the determinants of the VAT gap confirmed by empirical analyzes in the literature. The reasons for this state of affairs should be seen in the basic problem related to the measurement of this phenomenon. However, it is possible to point to a few studies

conducted so far that have a basic view of the determinants of the VAT gap in the EU, e.g. Piggott and Whalley (2001) or Zídková (2014). The VAT gap is one of the areas of economic activity that are difficult to measure, as are the level of the shadow economy and the level of corruption. The CASE (Center for Social and Economic Research) organization is responsible for measuring the level of the VAT gap for the EU.

The study aims to indicate the impact of the key determinants of the VAT gap in the EU and Poland. Conclusions from the analyzes carried out will allow to indicate whether the determinants of the VAT gap are identical in Poland and the EU. If, however, differences are indicated, they will allow for the formulation of areas of a different impact of the given determinants of the VAT gap in Poland. As a consequence, it will be possible to indicate those areas which are influenced by the EU and Poland in the fight against the VAT gap. The conclusions drawn on the basis of the study constitute the main added value because they are the first attempt to empirically verify the differences between the determinants of the VAT gap in Poland and in the EU.

An empirical study was carried out on panel data collected for 26 EU countries, including Poland, in 2000–2018. The study was conducted on the basis of data collected from CASE and the World Bank. Using the research using the GMM system, conclusions were formulated pointing to specific determinants of the VAT gap, which affect both the EU countries and Poland. Growth, trade, consumption, and corruption are key determinants of the VAT gap in the EU. These determinants also affect the VAT gap in Poland, but with a different strength and direction (consumption and corruption), which is crucial for shaping the individual policy of Poland.

2. Literature review

While browsing the literature on the subject, it can be noticed that it mainly discusses issues related to the measurement of the VAT gap, while there is little empirical research conducted on the data on the VAT gap. One of the first empirical studies on the macroeconomic determinants of the VAT gap was carried out by Agha and Haughton (1996, pp. 303–308), who showed the impact of the following factors on the VAT gap among 17 OECD countries: population of a given farm, duration of education or higher administrative expenses. It has been shown in this study that the increase in the VAT gap is related to the larger population of a given country, shorter duration of education, and lower administrative expenses. Thus, it was indicated that countries with a large population, lower level of education, and poorer countries will especially suffer from VAT non-collection.

A study on EU countries was conducted by Zídková (2014), based on which she indicated that the key determinants of the VAT gap in the EU are consumption and economic growth. On the other hand, the remaining determinants of the VAT gap include the shadow economy and trade. The impact of trade

was questioned in literature by the argument that only imports in the EU are subject to VAT, and exports do not generate VAT receipts (Nerudova & Dobranschi, 2019, p. 12). However, the fact that only imports affect VAT revenues does not mean that the level of trade should not affect the size of the VAT gap. On the other hand, the negative impact of the shadow economy on the VAT gap was also confirmed by Piggott and Whalley (2001). Zídková (2014, pp. 528–529) pointed out that for countries with a high level of household consumption in GDP, it is consumption that is the main reason for the growing VAT gap. An example of a country with a high share of household consumption in GDP in Poland, therefore, in the case of Poland, tightening the flow of funds due to consumption should bring a significant result in the form of reducing the VAT gap.

Majerová (2016), on the other hand, examined the impact of corruption and economic growth on the VAT gap in the example of EU countries. The study showed that the main determinant of the VAT gap is the level of corruption, with countries with a higher level of corruption also having a higher VAT gap. This relationship was explained by Majerová (2016) by the relationship between corruption and the VAT gap, which are interdependent phenomena. Corruption makes it possible to avoid paying VAT, so more corruption will generally favor a larger VAT Gap. As a consequence, taking an active fight against corruption should bring double benefits in the form of a reduction in the level of corruption and a reduction in the VAT gap, because those citizens who avoided paying VAT due to corruption activities should lose this possibility and be forced to honestly disburse them. VAT due to the State. The significant impact of the level of corruption on the VAT gap was also confirmed by the European Commission (2009).

Recent years have also brought the development of research on institutional determinants of the VAT gap. This research trend is part of the Sarmiento (2016) study, which showed a significant impact of the efficiency of government administration and the experience of this administration in tax collection on the VAT gap. Similar conclusions have already been indicated in the literature when analyzing the attitude of taxpayers to the tax system. Citizens who perceive the tax authorities as entitled to their actions (McGee & Tyler, 2006, p. 17) or perceive themselves as active participants in the decision-making process on the number of tax burdens (Alm et al., 1993) will be more likely to pay their taxes more often. tax liabilities, including VAT liabilities.

Sarmiento (2016, pp. 94–95) also pointed to the significant influence of the monetary union on the reduction of the VAT gap, which was argued by the restrictive fiscal rules functioning in the euro area. The impact of the GDP level was also analyzed (so far studies analyzed only the impact of economic growth on the VAT gap) on tax collection and it was shown that countries with higher GDP per capita have a significantly lower level of the VAT gap.

On the other hand, research conducted in Lithuania by Bikas and Malikonytė (2020, p. 45) confirmed the impact of government spending, corruption,

turnover of small and medium-sized enterprises, inflation, and bankruptcy of small and medium-sized enterprises on the VAT gap. The main reasons for the increase in the VAT gap in Lithuania, according to the authors, were the increase in inflation and the number of bankruptcies of small and medium-sized enterprises.

Based on the above review of the most important results of research on the macroeconomic determinants of the VAT gap, it can be indicated that some variables have a permanent impact on the VAT gap regardless of the period and scope of the research sample. These variables include economic growth, trade, consumption, and corruption.

Based on the literature review presented above, it is possible to formulate the following research hypotheses:

- H1: Economic growth lowers the VAT gap in the EU and Poland.
- H2: Trade reduces the VAT gap in the EU and Poland.
- H3: Consumption increases the VAT gap in the EU and Poland.
- H4: Corruption increases the VAT gap in the EU and Poland.

According to the research presented in the literature, economic growth is conducive to reducing the VAT gap, which is supported by theoretical arguments indicating, inter alia, increasing the possibility of controlling VAT collection in rich countries that can afford an effective policy focused on VAT payment. An increase in the rate of trade will reduce the size of the VAT gap, as more trade will be experienced in rich countries whose import levels are high, but also well-controlled. A higher level of consumption will be conducive to a higher level of the VAT gap, as there will be relatively more opportunities for non-payment of VAT. In particular, this argument applies to countries with a high share of households in total consumption. On the other hand, corruption as a factor favoring tax avoidance will be associated with a greater level of the VAT gap in a given country. The research hypotheses will be verified in the empirical part of the work.

3. Methods and data

The empirical analysis was carried out based on basic descriptive statistics and an econometric model built with the use of the GMM system of Arellano and Bond's first differences. This model is created according to the following scheme. First, the first model differences are calculated, then the explanatory variables in the first differences model are replaced by instruments that are levels of the variables delayed by two or more periods (Dańska-Borsiak, 2009, p. 27). The form of the model is as follows.

$$VAT\ gap_{i,t} = \alpha_{i,t} + \beta_{i,t} VAT\ gap_{i,t-1} + \gamma_{i,t} B_{i,t} + \mu_{i,t}, \quad (1)$$

where:

$VAT\ gap$ — a measure of the VAT gap;

α, β, γ — coefficients;



B — are independent variables;
 μ — is the error that may be explained as follows:

$$\mu_{i,t} = \delta_{i,t} + \gamma_{i,t} + \varepsilon_{i,t}, \quad (2)$$

where:

δ — is the country-specific random effects;
 γ — is the random effects assigned to the period;
 ε — is a random component with basic properties.

The GMM Arellano and Bond (1991) differential estimator was used. This estimator was used due to the greater efficiency of the estimator concerning the UMM estimator, and also due to good asymptotic properties (Goczek, 2012, p. 57).

The correctness of the constructed model was verified based on the 1st-degree autocorrelation test (p-value should be less than 0.1) and the 2nd-degree autocorrelation test (p-value should be equal or greater than 0.1), as well as the Sargan and Wald test (in both cases, the p-value should be less than 0.1).

Data for the period from 2000 to 2018 concerning 26 EU countries, including Poland, were analyzed. Data for the following variables were analyzed:

- VAT gap (source: European Commission, Center for Social and Economic Research — CASE) — the difference between the assumed VAT receipts and the number of actual receipts;
- growth (source: World Bank) — % change in GDP;
- trade (source: World Bank) — a value of imports and exports as% of GDP;
- consumption (source: World Bank) — household consumption expenditure as% of GDP;
- corruption (source: World Bank) — corruption index ranging from -2.5 (maximum corruption) to 2.5 (no corruption).

4. Results

To indicate the differences between the basic descriptive statistics for Poland and other EU countries, Table 1 presents the statistics for the 25 EU countries, and Table 2 presents descriptive statistics for the data from Poland in the period of the analysis from 2000–2018. Based on the analysis of descriptive statistics it can be noted that the EU countries are significantly diversified in terms of the analyzed variables. The average value of the VAT gap (Table 1) was 15% and ranged from a value close to 0 to 46%. The average economic growth in the period of the analysis was 2.5% and ranged from -14.8% to 25.2% . The average trade rate was 107.9% (ranging from -1.2% to 108.4%), while the average level of consumption was 52.8% (ranging from -1.2% to 71.1%). On the other hand, the average level of corruption was 1.1, while for the given EU countries the lowest value of corruption was -0.5 , and the highest was 2.5. When analyzing the correlation between the VAT gap and economic growth, it should be noted that there was no correlation between these variables for EU countries,

while the VAT and trade and consumption gaps are low, and the correlation with the level of corruption is very high. This means that the impact of corruption on the level of the VAT gap is one of the key relationships in the case of the EU.

When analyzing the correlation of the VAT gap and selected variables for Poland (Table 2), it can be seen that the correlation with growth is very strong and amounts to -77% . The correlation of the VAT gap with trade and consumption is moderate, while the correlation between the VAT gap and corruption for Poland is positive and amounts to 20.7% . This is a different result from the correlation obtained between these variables for the EU countries. In the case of the EU countries, this correlation was high and negative, which means that the increase in the corruption index was associated with a decrease in the VAT gap. In the case of Poland, the increase in the corruption rate was associated with an increase in the VAT gap, which is contrary to the theoretical assumptions and results obtained so far in studies for other European countries (e.g. Cevik et al., 2019, p. 350). Such a result was obtained because the analysis covered the period in which the tax system was reformed, as a result of which the VAT gap was significantly reduced in Poland.

Based on the analysis of the correlation of the VAT gap and selected indicators, it can be indicated that for Poland the correlation of the VAT gap and economic growth, consumption, and trade is much higher than for EU countries, while the EU countries showed a high correlation of the VAT gap with corruption, which was not observed in Poland. This conclusion shows that there are significant differences between the determinants of the VAT gap in Poland compared to other EU countries. Exactly this aspect was investigated using the econometric model, the results of which are presented in Table 3. This model was constructed as follows. The dependent variable is the VAT gap, and the explanatory variables are the value of the VAT gap, lagged by one period, and growth, trade, consumption, and corruption, for each of these variables a binary variable has been added that takes a value different from zero for data from Poland, which means that a binary variable corrects the influence of a given explanatory variable for data from Poland. With the help of the GMM system of the first differences of Arellano and Bond, the model of the following form was obtained:

$$\begin{aligned} \text{VAT gap}_t = & 0.1534 + 0.5537\text{VAT gap}_{t-1} - 0.0024\text{growth}_t - \\ & -0.0118\text{growth}(0-1)_t - 0.0001\text{trade}_t - 0.0013\text{trade}(0-1)_t - \\ & -0.0004\text{consumption}_t + 0.0016\text{consumption}(0-1)_t - \\ & -0.0407\text{corruption}_t + 0.1067\text{corruption}_{(0-1)t}. \end{aligned} \quad (3)$$

The coefficient for the dependent variable delayed by 1 period is 0.55, which means that the time series of the VAT gap is characterized by a certain long memory, therefore the shocks affecting the level of the VAT gap have their effects in a longer period. The coefficients for the dependent variables (without

binary variables) indicate the impact of a given variable on the VAT gap in EU countries, while the dependent binary variables allow, in total, non-binary variables to show the impact of a given variable on the VAT gap for Polish data. The impact of the increase on the VAT gap in the case of Poland is -0.0142 (for the EU this impact is -0.0024) and is higher than in the EU. The impact of trade on the VAT gap for Poland is -0.0015 and is much greater than this dependence in the EU (for the EU, this relationship is -0.0001 , so it is close to zero). On the other hand, the impact of consumption on the VAT gap in Poland is positive and amounts to 0.0012 (for the EU this impact is -0.0004). The impact of corruption on the VAT gap in Poland was 0.0660 , while this relationship in the EU is the opposite and amounts to -0.0407 .

The above-mentioned results were verified by four statistical tests, based on which the correctness of the obtained results and the construction of the econometric model can be indicated. Based on the AR(1) and AR(2) tests, it can be concluded that the instrumental variables used are correct. The p-value for the Sargan test allows the conclusion that there is no problem with the selection of instruments in the estimator. On the other hand, based on Wald's test, it can be indicated that it is not required to differentiate the intercept for all objects.

5. Conclusion

Based on the research described above, it is possible to indicate the following conclusions regarding the impact of selected determinants on the VAT gap in the EU and Poland. It can also be indicated that hypothesis 1 and 2 has been verified, while hypotheses 3 and 4 have been partially verified. At the outset, it should be noted that the time series of the VAT gap is characterized by the so-called long memory, i.e. the shocks resulting from the increase in the level of the VAT gap will have their effects and impact on the VAT gap for many years after this shock. As a consequence, the state policy in the EU and Poland should be conducted with caution in order not to lead to sudden increases in the VAT gap.

The impact of economic growth on the VAT gap in the case of Poland and the EU is negative and means that economic growth is associated with a decrease in the VAT gap, so generally countries with higher economic growth will have a lower VAT gap than countries with lower growth. Caring for a stable and possibly high economic growth translates into a gradual reduction in the level of the VAT gap. This conclusion is consistent with the research presented based on the literature (e.g. Zídková, 2014, p. 526). Since in the case of Poland this impact of growth is particularly greater, the Polish authorities should ensure stable economic growth which at the same time will help to reduce the VAT gap.

The impact of trade on the VAT gap was negative, which means that the increase in trade favored the reduction of the VAT gap (similar results were obtained, inter alia, by Zídková, 2014, p. 526). In the case of Poland, this negative

effect was much stronger than for the EU countries, which means that Poland should support trade in a special way, also through a stimulating trade policy, which will translate into a reduction of the VAT gap in Poland. In the case of Poland, this beneficial effect of the increase in trade on the reduction of the VAT gap was much more noticeable than in the case of EU countries.

The increase in consumption in the EU had a negative impact on the level of the VAT gap, while in the case of Poland, this impact was positive, which means that the increase in consumption was related to the increase in the VAT gap in Poland. Such an effect may be possible in the case of Poland, because Poland is characterized by a relatively low non-cash turnover in relation to EU countries (Sokołowska, 2015, p. 295), therefore it can be indicated that cash turnover is conducive to the creation of a VAT gap.

The increase in the corruption index (i.e. freedom from corruption) favored the reduction of the VAT gap in the EU, while in the case of Poland this impact was positive. This means that in Poland, the decline in the corruption index was associated with a decline in the VAT gap. In this case, it should be stated that the level of the VAT gap in Poland was reduced decisively, while the level of corruption did not improve significantly during the analysis period. This conclusion can also be indicated based on the analysis of descriptive statistics (Table 2) for data from Poland, where the level of corruption in Poland is clearly shown to fluctuate around a certain average during the analysis period. In the case of corruption, no significant reform was implemented that would significantly reduce the level of corruption during the analysis period, which is reflected in the impact of corruption on the VAT gap in Poland. Based on the correlation coefficient, it can be seen that the impact of corruption on the VAT gap in Poland is much less significant than the same relation in the case of EU countries.

Summing up, it can be indicated that the key determinants of the VAT gap in the EU include growth, trade, consumption, and corruption. The same determinants also affect the VAT gap in Poland, but with different strengths and in the case of consumption and corruption also with a different direction of influence. The above conclusions may be of interest to decision-makers managing the policy of reducing the VAT gap in Poland and the EU. Strong attention was paid to the differences between the EU as a group of states and Poland, which is part of the EU. It can be pointed out with full responsibility that actions aimed at reducing the VAT gap should be adapted to the specific conditions prevailing in a given country, as evidenced by the differences in the impact of the determinants of the VAT gap in the EU and in Poland. However, attention should be paid to the basic limitation of this study, consisting of a certain approximate measurement of the VAT gap, which currently cannot be measured with complete accuracy. However, the data presented by CASE are considered reliable and form the basis of the research carried out in the literature, which was referred to in the theoretical part. Conclusions from the conducted research allow for further deepening of the research and extending it to new variables, observation periods, and other EU countries.

References

- Agha, A., & Haughton, J. (1996). Designing VAT systems: some efficiency considerations. *The Review of Economics and Statistics*, 78(2), 303–308. <https://doi.org/10.2307/2109932>.
- Alm, J., Jackson, B.R., & McKee, M. (1993). Fiscal exchange, collective decision institutions, and tax compliance. *Journal of Economic Behavior & Organization*, 22(3), 285–303. [https://doi.org/10.1016/0167-2681\(93\)90003-8](https://doi.org/10.1016/0167-2681(93)90003-8).
- Arellano, M., & Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *The Review of Economic Studies*, 58(2), 277–297. <https://doi.org/10.2307/2297968>.
- Bikas, E., & Malikonytė, G. (2020). Assessment of factors determining VAT gap: a case study of Lithuania. *Journal of Security and Sustainability Issues*, 10(1), 35–46. <https://doi.org/10.9770/jssi.2020.10.1>.
- Cevik, S., Gottschalk, J., Hutton, E., Jaramillo, L., Karnane, P., & Sow, M. (2019). Structural transformation and tax efficiency. *International Finance*, 22(3), 341–379. <https://doi.org/10.1111/inf.12346>.
- Dańska-Borsiak, B. (2009). Zastosowania panelowych modeli dynamicznych w badaniach mikroekonomicznych i makroekonomicznych. *Przegląd Statystyczny*, 56(2), 25–41.
- Goczek, Ł. (2012). Metody ekonometryczne w modelach wzrostu gospodarczego. *Gospodarka Narodowa. The Polish Journal of Economics*, 259(10), 49–71. <https://doi.org/10.33119/GN/101012>.
- McGee, R., & Tyler, M. (2006). Tax evasion and ethics: a demographic study of 33 countries. *SSRN Electronic Journal*, 1–20. <https://doi.org/10.2139/ssrn.940505>.
- Nerudova, D., & Dobranschi, M. (2019). Alternative method to measure the VAT gap in the EU: stochastic tax frontier model approach. *Plos one*, 14(1), e0211317. <https://doi.org/10.1371/journal.pone.0211317>.
- Majerová, I. (2016). The impact of some variables on the VAT gap in the member states of the European Union company. *Oeconomia Copernicana*, 7(3), 339–355. <https://doi.org/10.12775/OeC.2016.020>.
- Piggott, J., & Whalley, J. (2001). VAT base broadening, self supply, and the informal sector. *American Economic Review*, 91(4), 1084–1094. <https://doi.org/10.1257/aer.91.4.1084>.
- European Commission. (2009). Study to quantify and analyse the VAT gap in the EU–25 member states. <https://doi.org/10.2778/018525>.
- Sarmiento, J. (2016). The determinants of value added tax revenues in the European Union. *The European Journal of Management Studies*, 21(2), 79–99.
- Sokołowska, E. (2015). Innovations in the payment card market: the case of Poland. *Electronic Commerce Research and Applications*, 14(5), 292–304. <https://doi.org/10.1016/j.elerap.2015.07.005>.
- Zidková, H. (2014). Determinants of VAT gap in EU. *Prague Economic Papers*, 23(4), 514–530. <https://doi.org/10.18267/j.pep.496>.



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Appendix

Table 1.
Descriptive statistics for EU countries (excluding Poland)

Variable	Mean	Standard deviation	Minimum	Maximum	Pearson's correlation
VAT gap	0.1532	0.0994	-0.0090	0.4600	1.0000
growth	2.5055	3.6486	-14.8386	25.1764	-0.0302
trade	107.9008	63.1780	-1.1747	408.3620	-0.2712
consumption	52.8196	12.8680	-1.1700	71.1194	0.1666
corruption	1.0986	0.8101	-0.4913	2.4700	-0.7225

Source: Own preparation based on World Bank data (software Gretl).

Table 2.
Descriptive statistics for Poland

Variable	Mean	Standard deviation	Minimum	Maximum	Pearson's correlation
VAT gap	0.2128	0.0589	0.0035	0.0990	1.0000
growth	3.7873	1.6222	2.6315	1.1258	-0.7701
trade	81.8986	14.6540	214.7410	58.1568	-0.4648
consumption	61.7492	2.3705	5.6194	58.4372	0.5230
corruption	0.5188	0.1814	0.0329	0.1388	0.2066

Source: Own preparation based on World Bank data (software Gretl).

Table 3.
Estimation results

Variable	Coefficient	p-value	Interpretation
VAT gap(t-1)	0.5537	0.0000	***
const	0.1534	0.0000	***
growth	-0.0024	0.0092	***
growth (0-1)	-0.0118	0.0001	***
trade	-0.0001	0.0056	***
trade (0-1)	-0.0013	0.0016	***
consumption	-0.0004	0.0863	*
consumption (0-1)	0.0016	0.0007	***
corruption	-0.0407	0.0000	***
corruption (0-1)	0.1067	0.0002	***
AR(1) p-value		0.0001	
AR(2) p-value		0.0960	
Sargan p-value		0.0000	
Wald p-value		0.0000	

Notes:

Significance levels for the parameters are given in the table: *** — $p < 0.01$; ** — $p < 0.05$; * — $p < 0.10$.

Source: Own preparation based on World Bank data (software Gretl).

