VAT efficiency in the countries worldwide

Sokolovska, Olena and Sokolovskyi, Dmytro

Research Institute of Financial Law, State Fiscal Service of Ukraine

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VAT EFFICIENCY IN THE COUNTRIES WORLDWIDE

Abstract

The article aims to estimate the efficiency of value-added tax (VAT) collection in the countries worldwide.

In a large part of developing and transition countries VAT performs primarily fiscal function, being the main source of budget revenue (for example in 2014 in Ukraine the revenue obtained from VAT was 51% of total tax revenue, in Moldova it achieved 58,2%). At the same time the shadow economy particularly in form of corruption and tax evasion that exists in these countries leads to a considerable tax gap which in turns reduces VAT efficiency.

So, the present study intends to define the VAT efficiency ratio in countries of the world. Preliminary theoretical and methodological analysis allowed us to use for calculations a modification of widespread formula, considering in a certain way a tax evasion process. We investigated the dependence between VAT efficiency ratio and size of shadow sector and level of corruption in countries.

This research will allow further investigation of the strategies for establishing of optimal VAT rates depending on efficiency of its levying and size of taxpayers which in turns will contribute to raising efficiency of VAT administration, to the reduction of shadow sector and to the economic growth.

Key words: VAT, efficiency, shadow sector, corruption

Introduction

In the latter half of the 20th century the taxation of consumption in most countries of the world became based on value-added taxes instead of sales taxes.

This determined an increase in revenue obtained from VAT collection and simultaneous increase of complexity of its administration. The tax exemptions, tax incentives, zero-tax rates etc. could be considered one of the main reasons of administration's complexity, which in turns favored to the growth of the shadow sector and the level of corruption.

These negative factors can be diminished considerably by an effective VAT. Commonly it implies the minimum difference between estimated and actually collected tax revenue. I.e. it is referred to the tax compliance. In turn the estimation of

VAT efficiency can provide the necessary information concerning level of VAT compliance in given country in order to determine the directions of improving of VAT administration.

So, this article aims to estimate quantitatively the efficiency of VAT collection in the countries of the world in order to investigate the dependence between VAT efficiency ratio and size of shadow sector and level of corruption.

Literature review

There are a number of theoretical and empirical studies aiming to estimate a tax compliance rates in the countries.

A large part of them consider a VAT compliance rate as ratio of actual VAT revenue to estimated VAT liabilities. In the Table 1 we summarize main previous studies in this area.

As it was mentioned above the efficiency of consumption taxes is closely associated with tax compliance rate. The main characteristic of this rate, and accordingly of the tax efficiency, is the estimation of the tax gap arising in consequence of tax non-compliance.

Table 1.

Authors and their main findings

Authors	Sample and period	VAT compliance rate formula	Main findings
Agha & Houghton (1996)	17 OECD countries, 1987	$$\frac{Actual\ VAT\ revenue}{Estimated\ VAT\ liabilities}$$	A higher VAT rate is associated with lower compliance. Compliance is substantially lower with multiple VAT rates. The more time to comply VAT the more is VAT compliance rate. The lesser country's population, the better is the VAT compliance.
Andrews & Mansoora (1996)	9 European countries, 1990-1993	*Tax compliance ratio* $$Actual\ Revenue \Big/ Potential\ Revenue$$	Tax compliance is a major issue in most analyzed countries. The ratio of actual to potential revenues (effective tax rates) is much lower than the official payroll tax rates.
Tanzi & Davoodi (2000)	83 countries, 1980-1997	$$\frac{Actual\ VAT\ revenue}{GDP} \Big/ Std\ VAT\ rate$$ $\{0;1\}$	The higher is the ratio, the more productive is VAT system. The lower is the ratio the more widespread is the extent of exemptions, tax evasion or weak tax administration. The higher is perception of corruption the lower is VAT efficiency ratios
Nam et al. (2001)	10 EU countries, 1994-1996	*Tax collection performance ratio:* $$\frac{Collected\ VAT\ revenue}{Collected\ hypothetical\ VAT\ revnue}$$	Positive correlation between the tax evasion and the level of VAT tax rates was less significant in the EU countries.
Otranto et al. (2003)	Italy, 1982–2001.	$$Estimated\ VAT\ revenue \\ -\ Actual\ VAT\ revenue$$	There is a positive relationship between VAT evasion and such factors as GDP, the share of the fiscal burden, the ratio of gross profits, the value added over the economy. The amnesty granted by government to tax evaders can have a negative effect on the level of the VAT gap
Daniel et al. (2003)	Emerging market and industrial economies	*Effective indirect tax rate:* $$\frac{All\ domestic\ taxes\ on\ goods\&services}{Private\ consumption}$$	A noticeable difference in effective indirect tax rates between industrial and emerging market economies. Emerging market economies generally have lower revenue ratios and effective tax rates than industrial countries. A considerable difference, measured by the coefficient of variation, in the volatility of effective tax rates.
O'Donoaghue et al. (2004)	12 EU countries, 1998	*Effective indirect tax rate:* $$\frac{Consumption\ taxes}{Total\ household\ income}$$	The effective indirect tax is on average three times higher for the bottom income decile than for the top decile

Christie & Holzner (2006)	29 EU countries, 2000-2003	$$\frac{Actual\ VAT\ revenue}{Estimated\ VAT\ liabilities}$$	VAT compliance is not affected by issues of inequality or poverty. A higher weighted average VAT rate reduces VAT compliance while a greater quality of judicial/legal system increases it. Countries where local authorities have more power have lower levels of VAT compliance.
Reckon LLP Report (2009)	25 EU countries, 2000-2006	**VAT gap share:** $$\frac{VAT\ gap}{Theoretical\ VAT\ liability}$$	There is no reliable statistical evidence of a relationship between the VAT burden and the VAT gap share. A lower perception of corruption appears to reduce the VAT gap share. Countries with a larger population have a larger VAT gap share.
Giesecke & Tran (2010)	Vietnam, 1999-2005	$$\frac{Aggregate\ actual\ VAT\ revenue}{Theoretical\ VAT\ liabilities}$$	VAT gap is generally determined by proliferation of both non-standard VAT rates and legal exemptions. Increase of VAT rates and removing/reducing exemptions can be an effective way of raising VAT revenue.
Barbone et al. (2013)	26 EU countries, 2000-2011	**The VAT Gap:** $$theoretical\ tax\ liabilities - collected\ revenue$$	Compared to VAT system with a single rate, no exemptions, and with perfect enforcement of tax laws the most important amount of revenue loss stemmed (in most countries) from choices made over time that have introduced and sometimes extended multiple rates and exemptions.
OECD (2012)	33 OECD countries, 1976-2009	**VAT Revenue Ratio (VRR):** $$\frac{Actual\ VAT\ Revenues}{Potential\ Tax\ Base\ \times Std\ VAT\ rate}$$	The level of the standard rate has a limited influence on the VRR. The different factors such as particular market circumstances, change in consumption patterns etc., significantly affect the VRR
Keen (2013)	Countries worldwide, 1993-2012	**The compliance gap**: *difference between the amount of VAT that is payable in principle and that actually received by government, expressed as a proportion of the former*	Compliance gap in most of OECD countries is quite extensive and it is primarily attributable to design rather than implementation.

Methodology

Broadly speaking all these estimations meet the definition of M. Keen (2013), according to which the compliance gap is simply the difference between the amount of VAT that is payable in principle and that actually received by government, expressed as a proportion of the former.

I.e. VAT efficiency ratio is

$$Ef_{VAT} = \frac{REV_{VAT\_act}}{REV_{VAT\_est}} \tag{1}$$

where REV_{VAT_act} and REV_{VAT_est} denote the actual and estimated VAT revenue respectively.

Economically, this efficiency ratio reflects the ability of government to collect tax revenue. The lower it is, the higher is the difference between real and declared income, and the fewer economic agents pay taxes.

But it should be noted that calculation of this index as ratio of actual revenue obtained from collection taxes to estimated one does not take into account the fact that decrease in the tax revenue can be determined not only by shifting to the shadow sector, but also by decrease in production and sales, by using the tax planning strategies (tax avoidance), by applying tax exemptions, tax incentives, zero-tax rates etc. in the tax system; although these factors lead to the reduction of tax efficiency ratio, they conform to the current law.

The availability of valid data, notably, concerning the share of revenue obtained from collection of certain tax in country's GDP, determined the choice of VAT as type of universal excise in order to calculate an appropriate efficiency ratio.

For this it is expedient to use formula (2), which contains the consumption costs.

$$Ef_{VAT} = \frac{REV_{VAT\_act}}{\tau_{VAT}} \cdot \frac{1}{Cons} \qquad (2)$$

where $Cons$ is the final consumption of households as % of GDP; τ_{VAT} is the standard VAT rate.

Let's analyze the formula (2). The VAT rate can be presented as ratio of estimated VAT revenue to the tax base. Therefore, the modification of (1) will be as follows:

$$Ef_{VAT} = \frac{REV_{VAT\_act}}{REV_{VAT\_est}} \cdot \frac{Base_{VAT}}{Cons} \qquad (3)$$

where $Base_{VAT}$ denotes the VAT tax base [1]

In terms of (3) the expression for Ef_{VAT} is in line with (1): it is the commonly used VAT efficiency ratio, but adjusted for the ratio of VAT tax base to the final consumption of households.

It should be noted that formula (3) in a certain way takes into account the presence of tax evasion or underpayment of taxes, which influence negatively on VAT efficiency, since a large part of concealed income is spent on consumption, i.e. it is reflected in this ratio.

Data

Variables for calculating the VAT efficiency ratio come from the World Bank's World Development Indicators (WDI), OECD Statistics database, ministries of finance of countries. In further analysis we used estimates of the shadow sector made by F. Schneider (2015) and the corruption perception index (CPI) which was extracted from the database of the Transparency International.

Results and Discussion

The obtained results for the countries worldwide are presented in Table 2.

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[1] Occasionally for calculations we used shares of actual VAT revenue and final consumption of households in GDP, since these data are indicated in the statistics. But this has no impact on the results.

Table 2

VAT efficiency ratio, 2012

Country	Final consumption of households, % of GDP	VAT revenue, % of GDP	Standard VAT rate, %	EF_{VAT}
Argentina	66,12	8,7	21	0,63
Australia	53,72	3,30	10	0,61
Austria	53,63	7,75	20	0,72
Belarus	45,92	6,33	20	0,69
Belgium	51,75	6,90	21	0,63
Brazil	62,62	8,50	18	0,75
Canada	55,66	4,20	5	1,51
Chile	62,75	8,06	19	0,68
Czech Republic	49,36	7,06	21	0,68
Denmark	48,82	9,71	25	0,80
Estonia	52,59	8,54	20	0,81
Finland	54,54	9,04	24	0,69
France	55,45	6,82	20	0,61
Germany	55,98	7,07	19	0,66
Greece	69,36	7,15	23	0,45
Hungary	53,78	9,11	27	0,63
Iceland	53,36	8,05	25,5	0,59
Ireland	45,99	5,92	23	0,56
Israel	56,59	7,32	18	0,72
Italy	61,14	5,90	22	0,44
Japan	60,66	2,72	5	0,90
Kenya	80,00	3,90	16	0,30
Korea, Rep.	51,37	4,26	10	0,83
Luxembourg	31,56	9,00	15	1,90
Mexico	66,27	3,72	16	0,35
Moldova	96,60	12,10	20	0,63
Netherlands	45,05	6,50	21	0,69
New Zealand	59,65	9,90	15	1,11
Norway	40,45	7,70	25	0,76
Poland	61,50	7,09	23	0,50
Portugal	65,71	8,23	23	0,54
Russia	49,09	5,70	18	0,65
Slovak Republic	57,48	5,98	20	0,52
Slovenia	56,20	8,04	22	0,65
South Africa	60,73	6,07	14	0,71
Spain	58,65	5,32	21	0,43
Sweden	46,54	8,94	25	0,77
Switzerland	54,34	3,50	8	0,81
Turkey	70,19	5,75	18	0,46
Ukraine	69,00	9,85	20	0,71
United Kingdom	64,79	6,87	20	0,53

In our calculations the index of final consumption of households considers the consumption of goods which are taxed not only by VAT and also by other consumption taxes, since the statistical services in countries do not normally delimit the consumption according the types of taxes. For countries with hybrid universal excises (Argentina, Brazil) the index of final consumption of households additionally includes the consumption of goods taxes by sales and turnover taxes. Taking into account the fact that other consumption taxes (excises, customs duties etc.) do not significantly influence on the tax revenue, and that they are presented to any extent in all examined countries, comparing the appropriate efficiency ratios (for the "pure" VAT and for consumption taxes at large), the general trend will not be distorted.

It can be seen that Ukraine and Moldova differ from other countries by high actual VAT revenue, expressed as a share of GDP. Particularly, Moldova has the highest value of this parameter – 12,1% while Ukraine is on the third place with 9,85%. Also Moldova is the "consumption" leader – 96,6% of country's GDP is accounted for households' final consumption. Kenya is on the second place with 80%. Ukraine takes the fifth place with 69,0% after Turkey and Greece.

The estimation of GDP is based on calculations of added value created by country's economy, so the share of VAT in GDP in various countries differs insignificantly and depends more on tax rate itself, but not on such institutional factors as size of shadow sector, level of corruption etc. The high share of VAT revenue in the total tax revenue indicates the presence of considerable disparities in favor of VAT, which are determined by substantial quantity of resources needed for its collection and for administration. The further statistical analysis confirmed the negative correlation between the calculated VAT efficiency ratio and such indices as size of shadow sector (as % of GDP) and level of corruption (as Corruption Perception Index – CPI) in countries (Fig. 1(a) and 1(b)).
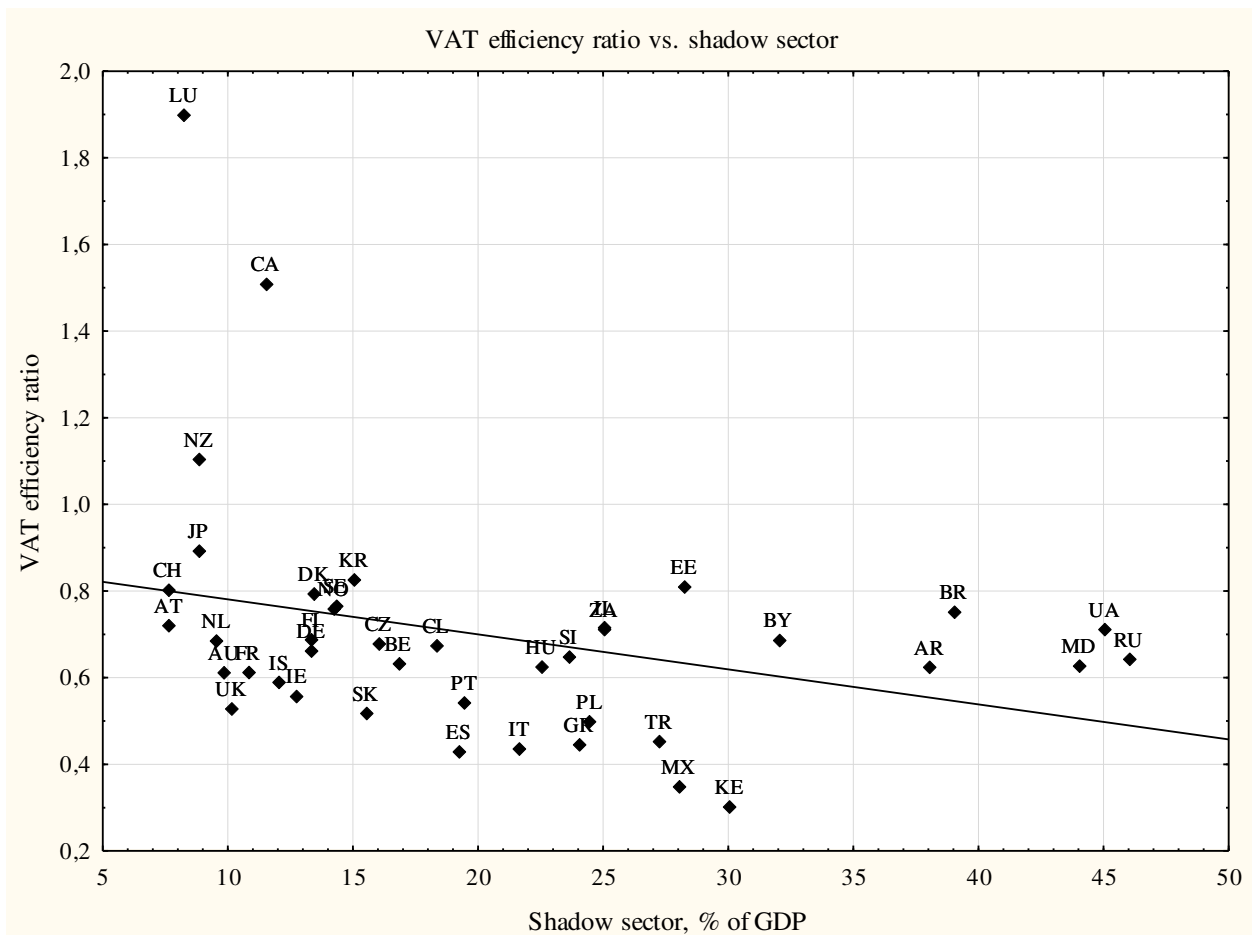
Fig. 1(a) The VAT efficiency ratio and the shadow sector in countries

Although this correlation is not linear and not very strong, it is evident that VAT efficiency is influenced by other factors which are not considered in this study. The general negative correlation between the VAT efficiency ratio and shadow sector and CPI as well, could be explained based on the left side of the formula (3), i.e. that for transparent economies the share of the unpaid taxes is small, and the estimation of VAT revenue is sufficiently precise, and vice versa is true for non-transparent economies.

Moreover, it could be noted that indicators for all analyzed countries are mainly localized in the rectangles ([0,4; 0,9]; [9; 30]) and ([0,4; 0,9]; [0,15; 0,9]) for the shadow sector and for the level of corruption respectively.
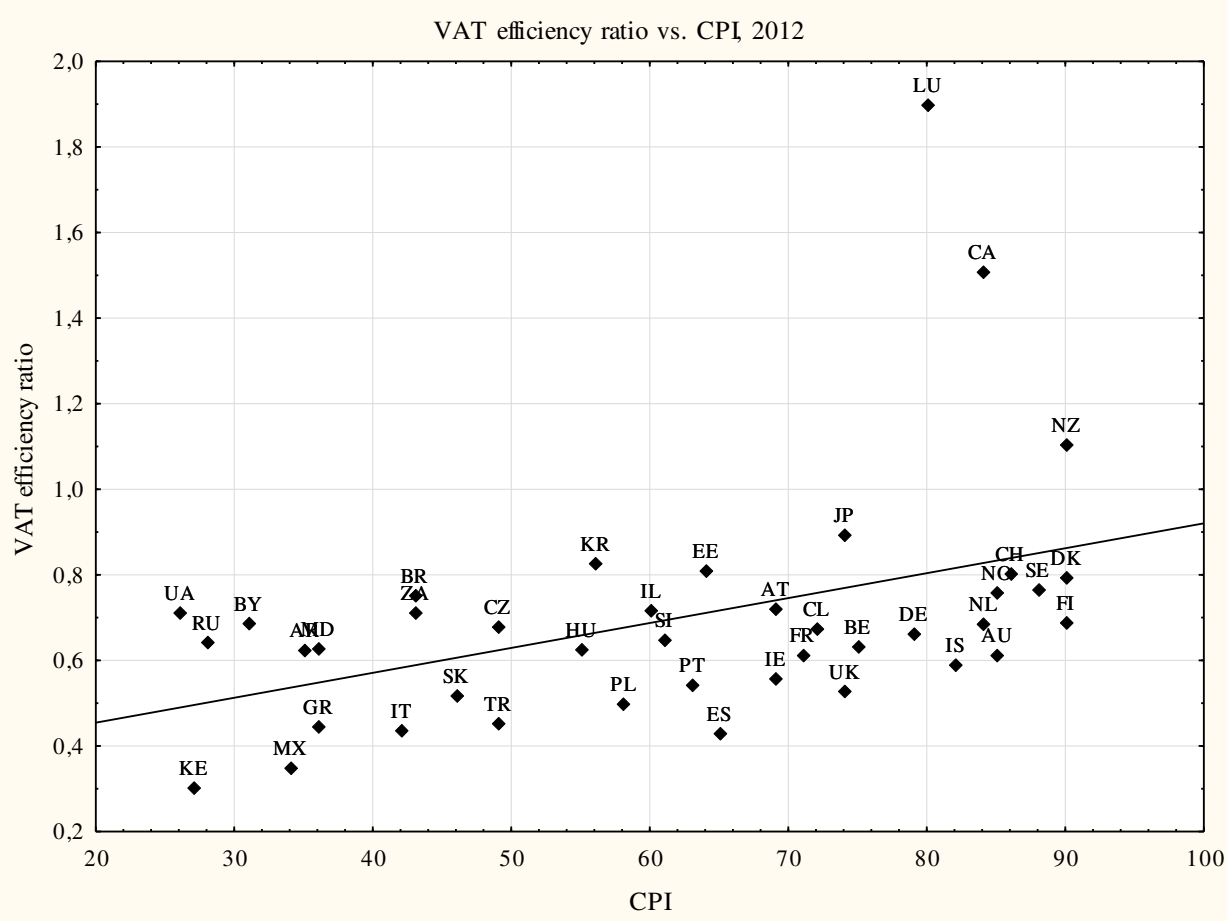
Fig. 1(b) The VAT efficiency ratio and the CPI in countries

As can be seen on the Fig.1, there are some countries plotted separately. Notably they differ by their level of the shadow economy and corruption which exceeds the average (for Argentina, Moldova and Kenya the CPI is within limits of default values); and also there are some developed economies with low level of corruption and shadow economy, characterizing by high efficiency of VAT collection: Canada, New Zealand, and Luxemburg (Japan fits partially into this group). To complete the picture we should note that two countries – Kenya and Mexico, have a lower VAT efficiency level than the left bound of the mentioned interval. These exceptions from the picture could be explained by the right side of the formula (3), namely by a relatively low (or high) level of final consumption compared with tax base. I.e., the more the country is developed, the more modest is its consumption. The VAT efficiency can be increased notably by optimization of the left side of the formula (3), i.e. by optimization of collected VAT. This lies

deep in the general problem of optimization of the tax burden, considered by Laffer. The game model (Sokolovsky (2014)), which takes into account the possibility of tax evasion and develops the Laffer's approach, providing rationales for potential presence of some local maxima, could be used for analysis and optimization of VAT collection.

Conclusion

We found the negative correlation between the VAT efficiency ratio and shadow sector and CPI as well, which could be explained by the fact that for transparent economies the share of the unpaid taxes is small, and the estimation of VAT revenue is sufficiently precise, and vice versa is true for non-transparent economies. Certain exemptions from the picture could be justified by relatively low (or, conversely, high) level of final consumption compared with the tax base. So, the VAT efficiency can be increased notably by optimization of collected VAT. The directions for future research lie in analyzing of practical aspects of simplifying the VAT administration.

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