Statistical approach to calculation of VAT and problems related to tax credit and export tax refund

Abstract. The Theory of National Accounts opens up new possibilities for improving VAT taxation. New terms have been introduced: statistical tax rates are equal to the current VAT rate multiplied by the share of value added for VAT or by the share of input for the export tax refund (ETR) in products output, which are calculated for selected sectors of the economy on the basis of National Accounts. Statistical tax rates allow for determining VAT or ETR from sales turnover, which reduces the probability of tax fraud. Time limitations associated with a three-year delay in the calculation of National Accounts are treated as insignificant in many cases. The authors of the article have suggested an algorithm of taking into account VAT exemptions and made calculations using statistical data for the United Kingdom of Great Britain. Information about VAT exempted turnover should be obtained from the State Fiscal Service of Ukraine and compiled into the National Accounts Database. The input-output approach to the calculation of VAT can be applied both for the analysis of tax legislation and for direct VAT assessment.

Keywords: National Accounts Database; Input-output Tables; Value Added Tax; Tax Rate; Export Tax Refund

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company’s profits, including depreciation of capital, or as a difference between the total output and intermediate input. There are four methods by which we can calculate VAT:

1. (Wages + profits) \times R - direct addition method (accounting method);
2. Wages \times R + profits \times R - indirect addition method;
3. (Output - input) \times R - direct subtraction method (accounting method);
4. Output \times R - input \times R - indirect subtraction method (invoice or credit method) [2].

Here R means the tax rate. Indirect methods are called so because value added itself is not calculated, however tax liability (credit) relevant to the components of value added is. The term «input» denotes raw materials or purchases for production other than labour. The term «output» means final goods and services sold or consumed for non-commercial purposes.

Comparison of the methods leads to the following conclusions.

Method 4 attaches tax liability to a particular transaction (the main advantage) and leaves good tracks for the audit, although today this barrier against manipulations is not sufficient.

Method 3 does not give certainty that inputs are deducted only when tax is paid. It is harder for tax payers to get a tax credit in full. Also, it is inconvenient to identify value added from different products each month as sales may greatly change.

For methods 1 and 2, it is necessary to determine the profit. Usually it is not broken down into individual products of the company, which may be taxed differently and inputs are never divided depending on VAT rates. Besides, calculation of profit requires considerable time.

Ultimately, method 4 is the best according to the fiscal economists, which is why we will use it henceforth.

The main advantage of the value added tax, if compared with the sales tax, is that there is no double taxation since the subject is not final consumption but only value added [3]. Due to the fact that each processing stage is levied, the tax is evenly distributed between companies. VAT is charged in most cases in accordance with the technique common in the world and meets the recommendations of the International Monetary Fund. The unification of the method has contributed to the spread of VAT and improvement of tax legislation by studying the experience of different countries. Following the same logic, the European Union has obliged its member states to harmonise their policies in the field of VAT. However, along with the positive trends, there appear negative ones over time.

The disadvantages of VAT include inflation of tax credit by fictitious transactions, understatement of import prices and overstatement of export tax refund by unscrupulous taxpayers [3].

The current algorithm for VAT has been functioning in Ukraine since 1997, when tax accounting was separated from accounting. Taxation procedures have become more complex, it takes more working time from taxpayers. Since electronic administration was introduced in 2015, it has been required to transfer money in advance to a special VAT account. For a long time VAT has been calculated on the same theoretical basis and tax administration has been constantly improved, nevertheless, it has not solved the problems. Today, scientists consider the ineffective tax administration, including the tax base erosion, to be a threat to economic security of Ukraine [4]. Therefore, further development of VAT is an urgent matter. This view has been shaped as a connection of twenty-year experience of VAT calculations for different enterprises from the part of one author and fifteen-year experience of scientific work from the part of the other author.

For many years, the accumulated problems have often been solved in the crossroads of several disciplines. In the second half of the 20th century National Accounts developed along with taxation. Currently, most of the UN member states compile «input-output» tables on the basis of financial and statistical reporting. Such calculations are of great importance, therefore they are done by skilled professionals in the field of modern math, as it is the basis for the calculation of GDP and the structure of the economy which are indicators of the field of modern math, as it is the basis for the calculation of GDP and the structure of the economy which are indicators of national statistical offices. Thus, data used above are encoded as follows: CP_MNAC, B1GQ, UK is GDP including taxes less subsidies on products at current prices in million national currency; CP_MNAC, B1G, UK is GVA no taxes less subsidies on products at current prices in million national currency; CP_MNAC, D21X31, UK are taxes less subsidies on products at current prices in million national currency, etc. This grouping is carried out at several levels: for example, for 10 aggregated economic activities and to all available separately: A 10 and A 64 by NACE [6]. There are other input-output databases, for example, Eora, GTAP and WIOD, Differences between them were analyzed by Owen, Wood, Barrett and Evans (2016) [7]. At present, the National Accounts statistics are increasingly applied by scientists for solving different economic problems [8; 9].

2. Purpose.

The purpose of this article is to connect the achievements in the field of taxation and National Accounts in order to create an alternative method for calculating VAT.

3. Results.

The authors’ approach is based on invariability of the tax and export tax refund amounts as we transit from one mode of calculation to another:

\[
\text{Recurrent} \times GVA = \text{Rstatist} \times VAT + \text{Op and Recurrent} \times I_p = \text{Rstatist ETR} \times Op, \quad (1)
\]

then \( \text{Rstatist} = \text{Recurrent} \times VA / \text{Op and Rstatist ETR} = \text{Recurrent} / \text{Op}, \quad (2) \)

\[
\text{VAT new} = \text{Rstatist} \times VAT \times SR \quad \text{and ETR new} = \text{Rstatist} \times ETR \times SR, \quad (3)
\]

where GVA - gross value added; Ip - input (intermediate consumption); Op - products (services) output in basic prices; ETR - valid VAT rate (for example, it is 20% in Ukraine); Rstatist - statistical VAT or export tax refund rates; ETR - export tax refund; SR - sales revenue.

Then GVA/Op is the key to solving the problem of overestimation of tax credit andIp/Op is the key to solving the problem of overestimation of export tax refund.

There are new terms introduced: the statistical VAT rate and the ETR rate. The statistical VAT rate is a rate of taxation of the sales revenue in order to obtain value added tax. It is equal to the current VAT rate adjusted for the share of value added in products output which is calculated for selected economy sectors on the basis of statistical data from National Accounts.

Similarly, the statistical ETR a rate is rate of the taxation of sales revenue to obtain the export tax refund. It is the ratio of the current VAT rate adjusted for the share of intermediate consumption in products output, which is calculated for the selected economy sectors on the basis of statistical data from the National Accounts.

The proposed method saves import VAT at the current rate. The method originates from Ukrainian and calculations of the statistical VAT rates are performed by Afanasieva (2016) [10]. In order to illustrate her approach to foreign colleagues, the authors refer to statistical data related to the United Kingdom of Great Britain. Table 1 shows the statistical VAT and the ETR rates for selected economy sectors. The statistical ETR rates are more for industries with a high share of exported products (NACE 24, 29 - Nomenclature of Activities for Community of Europe), which may be a feature of this activities or evidence of the discussed problems. It can be developed in further researches. Annual changes of statistical rates for whole economy are shown in Table 2. The absolute numbers are the same for the export tax refund, but with the opposite sign. Changes are less significant in the macroeconomic stability periods and vice versa. The results are approximate: they do not take into account tax exemptions and some features of pricing, as detailed below.

Advantages of the method.

The application of the statistical rates deprives market subjects of personal interest in fraud. Blurring of the tax base by the tax credit stops. The tax is calculated with regard to the sales revenue. It is not necessary to pre-calculate the tax base. It is only required to document income via cash registers or the banking system. This results in value
add tax. It provides all the advantages if compared with the sales tax. Similarly, it becomes possible to calculate the export tax refund. It should be added that money transfer to offshore zones begins with unaccounted cash, which can be formed as a result of bogus transactions to obtain overstated loans.

Assessing the advantages of the proposed method, it is useful to take into account the results of the corruption study in Ukraine conducted by Ukrainian authorities along with international organisations, such as Transparency International (2015) [12], Gesellschaft fur Konsumforschung and Pricewaterhouse-Coopers Ukraine. The survey was conducted among 2,741 corporate directors. The companies were chosen according to the regional criteria, turnover and type of activity for the sample to be representative. Opinions about the corruption centers of all the respondents who experienced that in August-October, 2015, are given in descending order: 26.7% - tax authorities, especially VAT; 7.0% - financial authorities; 6.3% - Customs; 6.0% - the State Agency of Land Resources; 3.5% - the Prosecutor General’s Office of Ukraine, etc.

Testing and development. It is required to obtain information about tax exemptions and turnovers when VAT is not charged on small taxpayers and those who pay taxes with regard to special tax incentives grouped by industry. We also need the actual VAT data by those sectors of economy which are not published. National Accounts by branches of industry contain information which includes VAT and excise duties and taxes on imports, yet this enables making only rough qualitative estimates. The new algorithm can be considered justified when calculating VAT for all industries and the whole economy will have a permissible deviation from the actual values.

Directions and scope of use. The proposed algorithm can be applied differently. It is logical to apply statistical as the check figures in the analysis of compliance with the current tax legislation. Small deviations from the actual amounts of the tax burden (VAT/SR) and share of the export tax refund (ETR/SR) from the statistical rates (average values) for a specific industry indicate that the company works on an equal basis. Consequently, significant deviations are likely to indicate tax fraud (Formula 3). It should be noted that the percentage tax burden (VAT/SR) for honest taxpayers is higher than the average value equal the statistical rate in this activity type and for unscrupulous taxpayers it is lower than the statistical rate.

The next step can be recalculation of the statistical VAT and ETR rates for those businesses that have shown a significant deviation from the check figures of the previous period. Finally, if the new algorithm proves its validity, it may complete replace the existing method completely, especially in those countries where violations of the current legislation are essential.

The existence of input-output databases makes it possible to spread the proposed algorithm to other countries.

**References**

2. Another limitation of the new algorithm is that National Accounts take intermediate consumption at purchaser’s prices, i.e. including VAT, whereas the International Accounting Standards account raw materials excluding VAT. This may be the reason why Blades (1989), thinking of a revision of the system of National Accounts, wrote: “The new version will provide an appropriate treatment of value-added taxes.” This task remains important.
3. Excluding VAT from intermediate consumption is not so simple. The point is that while transiting from the VAT levying Method 3 to the VAT levying Method 4, the total tax is no longer related to the value added, but to the total turnover, which is deducted on the amount of taxable turnover for every separate company. If the company uses tax-exempt goods or services, then, while selling products, it will have to pay VAT on such consumption. The situation with the imports is similar. This change was probably taken in favour of simplifying the pricing, when VAT at the standard rate is either charged to the output at the basic price or deducted from the output at a market price. The differences between the two pricing orders (let us call them the VAT order and the NA order) are clearly shown in Table 4. For example, when the consumption includes taxable turnover 45 plus VAT 20% = 9 plus tax exempted turnover 15 in a currency unit. How do the differences in the pricing procedure affect the proposed algorithm? Statistical rates change as follows: 40/109 is less than 40/100 and 69/109 is more than 69/100, as shown in Table 4.
4. Besides, you must add VAT to exempt consumption or subtract it from export tax refund. All this leads to some underestimation of VAT and overestimation of export tax refund. To eliminate this difference, the intermediate VAT consumption should be subtracted before calculating statistical rates. Finding the solution to this task is a subject for further research. By using information about tax exemptions by industries (16), we need to distinguish the taxable turnover from intermediate consump-
Note: Only the standard operating rate of 20% is taken into account. It is expected that the activities of

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