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ESTIMATION OF VAT GAP IN SLOVAK REPUBLIC

The article aims to estimate the evasion from value added tax in Slovak Republic in 2007–2011 using the indirect method based on the "top-down approach" and comparing the resulting estimates with the existing research. Estimation of tax gap using the method of supply tables and WIOD data pointed out that the average VAT gap is around 40%, and that the estimates of tax gaps identified in this contribution are comparable with the results indicated by CASE in 2013.

Keywords: tax evasion; VAT; tax receipts; top-down approach; WIOD.

JEL classification: H25; H26.

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ОЦІНЮВАННЯ РОЗРИВІВ У ПДВ У СЛОВАЧЧИНІ

У статті проведено оцінювання обсягів несплат податків на додану вартість у Словаччині протягом 2007–2011 рр., використовуючи непрямий метод за принципом низхідного аналізу. Авторські результати порівняно з аналогічними результатами в інших дослідженнях. Оцінювання податкових розривів на основі таблиць ресурсів та таблиць «витрати – випуск» вказує на те, що середній розрив за ПДВ у досліджуваному періоді склав 40%. Назагал, результати даної статті цілком порівнянні з результатами, отриманими у 2013 р. CASE (Центром соціально-економічних досліджень, м. Варшава, Польща).

Ключові слова: ухилення від податків; ПДВ; податкові надходження; низхідний аналіз; Всесвітня база даних таблиць «витрати – випуск».

Табл. 3. Літ. 32.

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ОЦЕНКА РАЗРЫВОВ ПО НДС В СЛОВАКИИ

В статье проведена оценка объёмов неуплаты налога на добавленную стоимость в Словакии за 2007–2011 гг., используя непрямой метод по принципу нисходящего анализа. Авторские результаты затем сравнены с аналогичными результатами в других исследованиях. Оценка налоговых разрывов на основе таблиц ресурсов и таблиц «затраты-выпуск» указывает на то, что средний разрыв по НДС в исследуемом периоде составил 40%. В общем, результаты в данной статье вполне сопоставимы с результатами, полученными в 2013 г. CASE (Центром социально-экономических исследований, г. Варшава, Польша).

Ключевые слова: уклонение от налогов; НДС; налоговые поступления; нисходящий анализ; Всемирная база данных таблиц «затраты-выпуск».

Introduction. VAT is the most susceptible to tax evasion and fraud, which are an "open challenge" for countries worldwide, and Slovak Republic is no exception. According to Slovak News Agency (SITA) evasion on VAT in Slovakia represents the largest share in total tax evasion (2.9% of GDP). Growing concerns about the loss of important sources of income from VAT due to tax evasion led many countries to introduction of various measures to eliminate them. Adoption and effectiveness of measures, however, is contingent on quality and accuracy of information about the condition and size of the shadow economy and tax evasion (Hajdu et al., 2014). The

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problem is that tax evasion and fraud as part of shadow economy represents activities, the volume of which cannot be exactly quantified. States try to estimate them using available data and a variety of qualitative and quantitative methods.

The issue of tax evasion, either in direct or indirect taxes, is paid much attention. It is an actual topic that is being discussed by the representatives of state, institutions as well as academia and general public, both nationally and internationally. Definition of tax evasion is provided by such Slovak and Czech scientists as (Orviska et al., 2006; Banociova, 2009; Kubatova, 2012; Zidkova, 2014; Dubravska et al., 2015), as well as foreign authors (Green, 2009; Filip, 2009; Murphy, 2010; Ene, 2011) and also international institutions (OCED, 2002; European Commission, 2014). Although there is some controversy in definitions of tax evasion and shadow economy, the authors agree that the volume of tax evasion currently has a growing tendency. In particular, the burden of direct and indirect taxes, the complexity of the entire tax and social system, and intensity of government regulation are known as the major causes of growth in illegal or hidden economic activities (Nam et al., 2001).

The key problem in the analysis of tax evasion is the lack of relevant and reliable data on taxpayers' performance. The volume of tax evasion is necessary to know for a number of reasons, to which belong that tax evasion distorts economic and business environment, they reflect the efficiency of tax system, and because the loss of tax revenues has direct impact on government economic policy (Banociova et al., 2012; Novysedlak and Palkovicova, 2012; Andrejovska and Banociova, 2014). Due to these reasons, there are many approaches to measurement of tax evasion and shadow economy (Kirchler et al., 2001; Alm, 2012; Levaggi and Menoncin, 2012). According to Alm's classification (2012), in market economies direct, indirect, and model methods are used creating part of traditional approaches to tax evasion measurement, as well as modern methods, which are beyond the common classification and show some creativity while measuring tax evasion. Table 1 lists the methods by which it is possible to measure tax evasion, along with their characteristics and indicating the selected research in which the method was used.

Data and methodology. The aim of this paper is to estimate the value added tax evasion in Slovak Republic by identifying the difference between total theoretical tax liability and real VAT receipts during the period of 2007–2011 using an indirect method based on the "top-down approach". Our findings allow pointing out the loss of VAT revenues and compare the obtained estimates with the results of other researches.

The original intention was VAT tax gap estimation during the period 2003–2013. Due to data availability in the method of supply and use tables, difficulties with calculating and comparability of the resulting estimates to foreign research the time frame unification was needed. Based on the mentioned facts, the timeframe was set as 2007–2011 (as the latest and most recent supply-use tables are only available until 2011). Determination of the observed period (2007–2011) was based on several factors:

- Limited data availability (data more recent than 2011 are not available and update should take place in late 2015) – WIOD database provides input-output tables only until 2010.
- Risk of inaccuracy and distortion in the estimations for 2011 due to the need to use other sources and classification of the supply and utilization – in 2011 data

were provided by the Statistical Office of Slovak Republic, which showed data in a narrow version of NACE 2nd Rev.

Table 1. Approaches to tax evasion measurement, own processing

	Name of the method	Method characteristics	Research
Direct methods (as reported by L. Mihokova and A. Andrejovska, 2014)	Sample survey method	- Measurement of tax evasion using questionnaires. - Estimation of tax evasion (eg.: in retail).	E. Kirchler et al. (2001)
	Tax audit method	- Based on the sample of audited taxpayers. - Estimation of tax evasion in the whole population.	E. Toder (2007)
Indirect methods (as reported by L. Mihokova and A. Andrejovska, 2014)	Method of contradiction	- Estimates of shadow economy between revenue and expenditure in national accounts (part of shadow economy, not included in the national accounts). - Monitoring of the difference between GDP calculated from the income registered for taxation and GDP obtained from the national accounts.	N. Gemmel and J. Hasseldine (2012); F. Schneider and P. Enste (2002)
	Monetary method	- Determination of the base year, when assuming no tax evasion. - Based on Fisher's quantitative theory of money.	J. Hanousek and F. Palda (2006); P.G. Porqueras et al. (2011)
	Labour market methods	- Comparison of information on employment from businesses with information obtained during household survey. - The rate of participation in the shadow labor market is derived from the rate of non-participation in the official labor market.	R. Bednarik et al. (2003)
	Methods of physical inputs	- The prerequisite is a stable ratio between physical inputs and production volume. - The best known method is estimation of GDP by electricity consumption.	J. Hanousek and F. Palda (2006)
	Multifactorial methods	- The link between causes and consequences of shadow economy and based on this, the relationship is quantified the volume of the shadow economy.	B.S. Frey and H. Weck (1983)

For estimation of VAT Gap in Slovak Republic the supply-use tables method was used. Estimation and analysis was realized in 7 steps:

1. Database creation. The source of the supply and use tables was WIOD, which listed data in the purchase prices in mln EUR. Data for determining VAT rates (%) for the period 2007–2011 were derived from TAXUD (European Commission, 2015) and Act. No. 222/2004 Coll. as amended and tax statistics of the Financial Policy Institute (IFP) of the Ministry of Finance of Slovak Republic. Details on the weights of individual goods and services for the reported period were obtained from the con-

sumer basket of products (COICOP classification) and the industrial producer price index. The indices were calculated based on the same period of the last year, as the data compiled by the Statistical Office of Slovak Republic, data for propex determination (the right to deduct) according to the tax laws (Act No. 222/2004 Coll., as amended). Database for quantification of gross fixed capital formation were from Eurostat database (2007–2011, mln EUR). Data on real accrual VAT revenues were also obtained from the Eurostat.

2. Estimation of theoretical revenues in 3 individual components was realized through WIOD database for Slovak Republic for the period 2007–2011. The total theoretical VAT revenues consisted of 3 components (theoretical VAT revenue from final consumption of households, government and non-profit institutions, theoretical VAT revenue of intermediate consumption and theoretical VAT revenue from gross fixed capital formation). All 3 components were estimated using the existing methodology (for full description – see (CASE, 2013)).

3. Estimation of total theoretical VAT revenue: the sum of 3 individual components, see above.

4. Obtaining data on real accrual VAT revenues in Slovak Republic.

5. Quantification of the tax gap: quantification of a difference between theoretical VAT revenues and real accrual VAT revenues.

6. Application of additional adjustments and assumptions: for final calculation certain adjustments should be considered which in this paper represents a part of the analysis of the resulting estimates.

7. Analysis of the resulting estimates of VAT tax gap in Slovak Republic and their comparison to the resulting estimates of tax gap in the available global research.

The key method in this paper was analytic-synthetic method. Statistical analysis of secondary data was secured using mathematical and statistical methods supported by statistical programs and software such as "MS Excel" and "SPSS Base".

Key results of the research. Method of supply-use tables is a complex and laborious one requires large amounts of data and complex calculations. Since it is not in the scale of this contribution, all calculations in tables show the resulting value estimates of VAT tax gap in Slovak Republic only. Estimation of total theoretical VAT revenue is presented as the sum of estimated 3 partial theoretical revenues (Table 2).

Table 2. Total theoretical VAT revenue during 2007–2011, mln EUR, own processing on WIOD data

Year	Theoretical VAT revenue from consumption	Theoretical VAT revenue from intermediate consumption	Theoretical VAT revenue from gross fixed capital formation	Total theoretical VAT revenue
2007	5,710.22	442.72	587.94	6,740.88
2008	5,464.76	439.68	620.42	6,524.86
2009	5,910.01	399.44	704.64	7,014.09
2010	5,773.24	462.75	709.45	6,945.44
2011	6,612.30	1,078.38	887.95	8,578.63

To quantify the resulting theoretical VAT revenue from the final consumption, each product according to CPA classification has assigned VAT rate, either covered

by the basic rate of tax reduced tax rate, or product was tax free. Subsequently, the weight was assigned to each product according to the proportion of goods and services in household consumption (consumption basket), or weight according to the industrial producer price index. Weighted VAT rate was determined as multiplication of weights of goods and services and VAT rate. The resulting weighted VAT rate in branches has been then multiplied by total final consumption listed in the supply-use tables for a given year to give the theoretical revenue for the industry according to the aggregated classification NACE Rev.2 and by following summarization the partial theoretical VAT revenue of final consumption was obtained.

Resulting estimations shows the cyclical nature and the range from 5,464.76 mln EUR in 2008 to 6,612.30 mln EUR in 2011, when the theoretical revenue reached its maximum. As it was in the CASE study (2013), between 2010 and 2011 there was a significant increase in the contribution of almost 840 mln EUR. A significant part of the growth in theoretical VAT revenue during the whole observed period has final consumption of households including non-profit institutions serving to households. The abovementioned foreign study notes that VAT liability from the household sector is higher than the EU-26 average. Although big gap makes it difficult to gauge the economic significance of this percentage. Reasons for changes in cyclical developments of the estimations could be interpreted by legislative changes in the form of changed tax rates, namely the increase in the basic tax rate to 20%, introduction of 6% tax on yard sales in May 2010, its subsequent abolition in January 2011, and replacement by the basic tax rate, as well as increasing of the period for adjustment of tax deductions in case of change of the purpose of fixed assets use (buildings, apartments, commercial spaces etc.) from 10 to 20 years. Changes on estimated theoretical revenues reflect the changes in the weights of individual products in consumer basket and their final consumption within the following sectors: food, beverages and tobacco, electricity, gas and water supply, agriculture, hunting and fishing, mining and quarrying, basic metals, and fabricated metal products.

In the next step theoretical VAT revenue of intermediate consumption was estimated. The calculation method is similar to the final consumption of households so propex was entered into calculations, expressing the right to share deduction (% of exemption in each of 59 categories in CPA classification). Each product has been assigned to VAT rate, depending on whether it is covered by basic or reduced tax rate, or it is tax free. Subsequently, the weight was assigned to each product according to the share of goods and services in household consumption (consumption basket) or was assigned according to the industrial producer price index and propex. The weighted VAT rate was calculated as a multiplication of weight of goods and services, VAT tax rate and propex. The resulting weighted VAT tax rate in the sectors has been multiplied by the value of intermediate consumption, noted in the supply-use tables for each year to obtain the theoretical VAT revenue for individual industries according to aggregated classification NACE Rev.2. Subsequently partial theoretical VAT revenue of intermediate consumption was obtained.

The resulting estimates showed that theoretical VAT revenue of intermediate consumption ranges from 399.44 mln EUR in 2009 to 1,078.38 mln EUR in 2011. Within the period 2007–2009 the revenue had a decreasing trend, which was subsequently reversed and in 2011 reached the maximum value for the observed period.

Due to the fact that the calculation was entered by the tax rate and the weight of products, the first reason for changes in the estimated revenues is the fact stated in the revenue of final consumption. An important part was also the propex, determination of which could affect the resulting estimates, in certain groups of products such as financial intermediation, except insurance and pension funding, activities auxiliary to financial intermediation and real estate. Those could, due to the impossibility of communication with national authorities, arise inaccuracies. The estimates have been significantly affected by the volume of intermediate consumption, which had in 2007–2009 a decreasing trend with the average annual drop of 6.5%, which resulted in theoretical revenue decrease in the crisis years to. Subsequently, in 2010 and 2011 there has been a significant increase, as confirmed in the CASE study (2013), which states in 2011 the value of 1,133 mln EUR as the theoretical revenue of intermediate consumption.

The third part was the calculation of theoretical VAT revenue from gross fixed capital formation (GFCF). Since revenue estimation requires communication with authorities and obtaining relevant data is complex, time consuming, and certain data are not available to public at all, we used a different method. This fact, however, could cause significant inaccuracies and deviations from the estimates in other research. Our method was based on the Eurostat database, which provides data on GFCF divided into different sectors according to NACE Rev.2 classification. Since Eurostat has data only until 2010, the necessary data for 2011 were obtained after communication with the Statistical Office of Slovak Republic. The obtained data on GFCF by individual sectors were linked to the GFCF data in the following sectors: households, government, financial corporations, non-financial corporations and non-profit institutions. Linking consisted of expressing GFCF share on each sector in individual branches. Multiplication of this GFCF share and GFCF values in different branches according to NACE Rev.2 for each sector, and subsequent summarization of the values represented partial theoretical VAT revenue of GFCF.

As shown in Table 2, in the development of theoretical revenue of GFCF increasing trend throughout the whole observed period is visible. Theoretical GFCF revenue is increasing every year with the annual average growth of 11.2%, the value rose from the level of 587.94 mln EUR in 2007 to 887.95 mln EUR in 2011. In estimations of theoretical GFCF revenue crisis manifestation were not present. Similar development was also mentioned in CASE study (2013) that estimates theoretical GFCF revenue in 2011 on the level of 892 mln EUR.

The largest share of total theoretical VAT revenue (up to 82.3%) has the final consumption of households, which is also the most important source of tax revenues under this method. It is followed by GFCF of exempt sectors, representing the 9.8% share of the total theoretical VAT revenue, and the intermediate consumption of exempt sectors participated in this case with the lowest rate (7.9%). For quantification of VAT tax gap the difference between total theoretical VAT revenue and real VAT revenues in any given year had to be calculated. The resulting estimates of VAT tax gap size using the method of supply-use tables is shown in Table 3. Development of quantified VAT tax gap had a decreasing trend until 2008, between 2009 and 2010 stagnated at almost the same level, and in 2011 there was significant growth. In absolute terms during the observed period it reached the values between 2,071.36 and

3,867.73 mln EUR, in relative terms, the range was 31.75–45.09%. The average tax gap during the examined period was 40%, which, compared with the average value of VAT tax gap in CASE study (2013) for Slovak Republic is 5% higher.

Table 3. VAT tax gap estimation by the method of supply-use tables for 2007–2011, mln EUR, authors'

Year	Total theoretical VAT liability (VTTL)	VAT receipts	VAT gap	VAT gap (% of VTTL)
2007	6,740.88	3,699.00	3,041.88	45.13
2008	6,524.86	4,453.50	2,071.36	31.75
2009	7,014.09	4,221.30	2,792.79	39.82
2010	6,945.44	4,182.10	2,763.34	39.79
2011	8,578.63	4,710.90	3,867.73	45.09

The difference between resulting estimates could be due to different sources of national accounts data. There are slight differences in volumes of consumption expenditures and Eurostat and WIOD tables, and also certain methodological adjustments in estimating various sub-components of the overall theoretical VAT revenue. Differences also could be due to other factors which are listed in the conclusions below.

We can state that theoretical VAT revenue is growing faster than tax revenues, which since 2008 does not vary a lot, on the contrary, in the period 2008 to 2010 there was a slight decrease in tax revenues. A slight increase took place in 2011, but not as much as the growth of theoretical VAT revenue, which was finally reflected in the size of VAT tax gap in that year. Based on this we can assume that VAT tax gap tended to increase since 2010.

The current study that deals with the estimation of VAT tax gap in the EU Member States, is the CASE (2013), which used the method of supply-use tables. CASE (2013) attributes Slovakia to the group of EU countries with high VAT tax gap. The average VAT tax gap in 2000 to 2011 was 35%, therefore it stands at the fifth quantile of the observed 26 EU members. In 2003, Slovakia experienced a reduction in tax gap, due to reduction in the standard VAT rate from the original 25% to 20%, but reduced VAT rate on the contrary increased by 4% from the initial 6% to 10%. Consequences of the global financial and economic crisis led to country's incomes reduction, which was reflected in an increase in VAT tax gap to more than 30%. From 2000 to 2011 Slovakia changed the standard and reduced VAT rates 6 times.

Basing on the comparison of the results it can be concluded that estimates of tax gap identified in the paper are relatively comparable to the results in (CASE, 2013). In case of final consumption the theoretical VAT revenue determined in the study reached higher values. The differences may be due to several factors such as differences in data sources, method of calculation or a different classification of products, as well as the use of additional adjustments that capture different aspects of the VAT system which have the ultimate impact on estimation of theoretical VAT revenue. Due to the unavailability of certain data, this contribution ignores the adjustment mentioned by CASE (2013) (adjustment for companies in the context of the threshold value for VAT registration, restrictions on the right to deduct VAT on commercial

vehicles and fuel etc.). This led to the resulting differences in the estimates of theoretical VAT revenue and, ultimately, VAT tax gap estimation.

Conclusion. The importance of VAT is constantly increasing, at the same time, however, it is an object of constant tax evasion. Measurement of such evasions is an open challenge, because methods used worldwide bring different results. The aim of this paper was to estimate VAT tax evasion in Slovakia. The analysis focused on the estimation of VAT tax gap, thus on the identification of differences between theoretical and real VAT tax revenues and this analysis in Slovak Republic, 2007–2011 applying the method: method of supply and use tables. Estimation of theoretical VAT revenue was in accordance with the methodology of 3 partial theoretical earnings. The largest share in the total theoretical VAT revenue (up to 82.3%) had the final consumption of households, which is also the most important source of tax revenues under this method. It is followed by GFCF of exempted sectors, representing a 9.8% share of the total theoretical VAT revenue, and the lowest rate (7.9%) is represented by intermediate consumption of exempted sectors.

Tax gap estimation pointed out that the average VAT gap varies in the method of supply-use tables at the level of 40%. Theoretical VAT revenue is growing faster than tax revenues, which does not vary a lot since 2008, on the contrary, in the period 2008 to 2010 there was a slight decline in tax revenues. A slight increase took place in 2011, but not as much as the growth of theoretical VAT revenue, which is ultimately reflected in the size of VAT tax gap in that year. Based on this we can assume that VAT tax gap has since 2010 an increasing tendency. As demonstrated by obtained results, the tax gap tends to increase especially since 2009 when there was an increase in its size by 13% until 2011.

Comparison of resulting estimates of VAT tax gap in Slovak Republic was carried out with the estimates of (CASE, 2013). Basing on the comparison of the obtained estimates with these studies we can mention an upward trend in the size of VAT tax gap in particular since 2009, which is especially visible in the VAT tax gap estimates obtained using the method of supply-use tables, increased in 2011 by 14%. From thus comparison we can conclude that estimates of tax gaps identified in this paper are comparable to the results of (CASE, 2013). In the case of final consumption the theoretical VAT revenue determined in the study reached higher values. The differences may be due to several factors such as differences in data sources, calculation method or using a different classification of products, as well as the use of additional adjustments that capture different aspects of VAT system and which ultimately affect the estimates of theoretical VAT revenue. Despite some drawbacks in the method of supply-use tables, it can be considered as relatively accurate, as it takes into account not only the actual supply-use tables and national accounts, but also includes weighted VAT tax rates for all goods and services, in particular by industrial branches. At the same time it differentiates the types of use – for final consumption or intermediate consumption.

To assess VAT evasion in a country the estimation of tax gap size is very important. Since the method used in this paper does not allow finding out, in which areas specifically tax evasion occurs, it is an appropriate instrument to assess their development or trend. VAT tax gap measurement is also important as an evaluating tool for determination of effectiveness of various measures that have been taken in the fight

against tax evasion. That this is the first analysis using the supply-use tables' method, not all methodological issues were solved sufficiently, thus, the results must be regarded as a rough estimate and will become the subject for further research.

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