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The definitive VAT system and its impact on tax collection

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Abstract. Value Added Tax (VAT) is a significant source of fiscal revenues in the EU. However, the VAT treatment of cross-border supplies enables large-scale tax frauds, such as the Missing Trader Intra-Community (MTIC), which takes each year billions of euros from Member States' public budgets. In 2016 a definitive VAT system was proposed by the European Commission to respond to the shortcomings of the current temporary system. This new system should reduce the possibilities of MTIC fraud for intra-community transactions through the collection of VAT by the supplier in the same way as for domestic transactions. The tax collection by the supplier would impact the administrative costs of the financial authorities. This paper contributes to the discussion about the advantages and disadvantages of the newly suggested system. The analysis focuses on the study of the change in administrative costs and VAT revenues for individual Member States and across the EU. The results are that after implementing the definitive VAT system, total administrative costs of the Member States would increase at least by EUR 107 million, whereas total VAT revenues would rise by EUR 40 billion. This indicates the overall positive impact of the definitive VAT system for the EU. However, individual Member States would not benefit equally. The net exporters, whose intra-community supplies exceed the intra-community acquisitions, would spend more than others for the collection of VAT in connection with the international trade of goods.

1. Introduction

The value added tax (VAT) is one of the main sources for financing public spending in the EU member states. Unfortunately, the collection of VAT is affected by missing trader intra-community frauds (MTIC frauds).

According to Poniatowski et al. (2020), the value of VAT gap, which represents the volume of VAT evasion, including MTIC fraud, reached EUR 137 billion in 2019 in the whole EU. Fighting against VAT fraud, therefore, belongs to major priorities of EU's tax policy (European Commission, 2010). In this connection, a draft amending the Council directive on common system of VAT (European Council, 2006) was filed in 2017 (European Commission, 2017). The purpose of the draft was the transformation of current VAT treatment applicable for intra-community supplies of goods between businesses (intra-community B2B supplies) to a new mechanism, so-called definitive VAT system. The current regime was implemented in 1993 and was meant to be temporary. As the main disadvantages of the current system are considered, both predisposition to tax evasion and high demands on tax compliance of businesses while trading on the intra-community level.

The key difference between the current and the definitive system lies in replacement of two mirror "taxable supplies" requiring mirror reporting involved in cross-border transactions. These two "mirror supplies" are intracommunity supply and intracommunity acquisition. They will be replaced by only one transaction - supply of goods within EU. This supply will be taxed by suppliers in their own countries by the VAT rate of the destination country. The collection of VAT on B2B cross-border supplies will be organized through so-called One Stop Shop. In practice, when doing business on the intra-community level, the invoice would include tax of the country of destination (where the goods are being delivered) while the supplier would pay the tax to the tax authority in his own country (European Commission, 2017a). Subsequently, local tax authorities would transfer collected VAT to tax authorities in destination countries. The system would be working similarly to Mini One Stop Shop that is already used for electronic, telecommunication and broadcast services provided to non-taxable persons and recently (since 1. July 2021) expanded to cross-border supplies of goods to non-taxable persons (B2C cross border supplies).

According to European Commission (2015), the drafted definitive system would lead to a reduction of compliance duties of businesses. The study also shows that the definitive system reduces the MTIC frauds in the EU, which would result in higher VAT revenues for public budgets. Nonetheless, we believe that the benefit of the definitive system would not be equal in all EU Member states. The value of savings would be affected by the volume of MTIC frauds in each state. The higher the size of these frauds in the country is, the higher the amount of additional revenue should be expected.

Negative consequences of the definitive system in terms of increased tax administration costs will most likely arise due to the additional transfer of collected VAT between financial authorities of different Member States (Lamensch, 2012). Like the additional VAT revenues, the change in the administrative costs would not be uniform in all engaged states. A relatively better position (decrease in administrative costs after implementing the definitive system) might be expected in Member States with higher B2B intra-community acquisitions of goods than B2B intra-community supplies as they will stop collecting the VAT from acquisitions and start collecting it from the intracommunity supplies. On the other hand, states with more B2B intra-community supplies than acquisitions would collect payments for other countries, and their administration costs would increase relatively more compared to the current system, where they levy VAT on intra-community acquisitions and not intracommunity supplies.

Provided that there exists a positive relationship between additional VAT revenues achieved by the definitive system and the change in administrative costs compared to the current situation, the implementation of the new system would be reasonable and thus acceptable for all Member States. On the condition that additional tax revenue is higher than additional administration costs, the transition into a definitive system would be advantageous also to countries with a higher amount of intra-community acquisitions.

This paper analyses impact of implementing the definitive VAT system on EU Member States through calculation of the change in administration costs, additional tax revenues and comparative analysis of these two factors. Firstly, we examine which of the Member States are

more supply- and acquisition-oriented (net exporters and importers). We only use the difference between B2B intracommunity supplies and acquisitions because we want to find out what the change in administrative costs will be. In the original system, the state had to collect VAT from B2B cross-border acquisitions, and in the new system, it will collect VAT from B2B intra-community supplies. Therefore, if the supplies are higher, the state's administrative costs will increase. If, on the contrary, the acquisitions are higher, his administrative costs will decrease. The goal is to calculate the amount of the change in administration costs incurred by individual countries while collecting VAT for other Member States in the definitive system. Secondly, the paper provides calculation of additional tax revenue for each Member State and examines whether there is a correlation between the change in administration costs and additional VAT revenues.

2. Literature review

The current system of VAT is based on the invoice-credit method and fractional payments. In such system, the supplier collects tax from the transaction while the purchaser has a right to deduct the tax paid. Therefore, the tax administrator collects the VAT gradually from all VAT payers inside the distribution chain (e.g. Schenk et al., 2015; Terra and Kajus, 2015).

The described system has been impacted by temporary rules for cross-border transactions applicable since 1993, when customs borders between Member States were cancelled. Under this temporary system, the invoice for a B2B cross-border transaction does not include VAT (intracommunity supply is VAT exempt) as the tax is fully levied by a state of consumption on the B2B intracommunity acquisition of goods. At the same time, to fulfil the purposes of VAT and its neutrality, the state of origin enables the supplier to deduct VAT incurred on purchases related to the B2B intracommunity supply of goods, i.e. VAT exemption with credit is applicable on the B2B intracommunity supplies.

The element of tax exemption likely increases VAT fraud opportunities. Fraudsters exploit the VAT exemption for B2B cross-border transactions to conduct MTIC frauds (European Commission, 2016). MTIC fraud mainly represents a situation when a taxpayer acquires goods from other Member State VAT free and supplies the goods locally afterwards. The fraud appears when the taxpayer (here called missing trader) vanishes, does not file the VAT return, becomes no-contact. This missing trader does not pay to the financial authorities the tax on the local supply of goods despite selling the goods, including VAT (Fedeli and Forte, 2011). The next member in the distribution chain – local purchaser – frequently does not know about the missing trader's intent and therefore normally pays VAT in the price to the supplier and then applies for VAT deduction (Ainsworth, 2009).

The definitive VAT system keeps the principle of fractional payments, which have the advantage of the so-called self-policing nature (Pomeranz, 2015). The tax administrator is permitted to check whether the purchasers' claim on input VAT corresponds with VAT declared

by the supplier (Cnossen, 2010). Each VAT payer is motivated to get tax documents from the supplier to claim back VAT on input. Input VAT can only be claimed through the VAT return. In the definitive system, VAT on theB2B cross-border acquisition of goods is not paid by the buyer anymore. The tax from the acquisition of goods and the right to deduct it are not cumulated with one and the same VAT payer. Therefore, a VAT payer who becomes a missing trader that does not file the tax return, is not only avoiding paying the output tax from his local supply but also cannot claim back the input tax incurred in the price that he paid for the goods purchased from another member state. In other words, since VAT definitive system replaces the tax exemption on cross-border transactions, the purchaser acquires from other Member State taxed goods. Therefore, if he/she disappears without payment of output VAT on subsequent local supply, he/she must sacrifice input tax deduction (Amand, 2014). This should lead to the reduction of MTIC frauds in EU (European Commission, 2015). However, there may still be tax evasion if a supplier from another Member State does not pay the tax in his State (state of origin) and the buyer claims it back in his State (state of consumption). This may be the case, in particular, if information systems are not interconnected between Member States.

The main advantage the definitive VAT system would be a significant reduction of MTIC fraud across the EU. However, some authors also point out several disadvantages of the definitive system. For example, VAT Expert Group (2016) criticizes administrative burdens of businesses and the possibility of making a mistake while selecting the correct VAT rate or while assigning the transport in a chain transaction with goods. Furthermore, the necessity of mutual payments between Member States is another setback. Zídková and Šťastná (2019) also notice potential deterioration in businesses cash flow due to including VAT in the price for cross-border supplies of goods and the obligation to remit this VAT to the financial authorities often before receiving the payment from the customer. At the same time, the authors point out the loss of financial authorities' control over cross-border transactions should the Intra-community sales list be canceled. De La Feria (2018) criticizes insufficient harmonization of tax bases in the present system, and Catarino and Moraes e Soares (2019) notice insufficient harmonization of tax rates.

Nevertheless, all these disadvantages may be outweighed by increased Member States' tax revenues. European Commission (2017a) estimates an increase in VAT revenues across the EU of EUR 40 billion per year due to the implementation of the definitive VAT system. This estimate is based on the size of carousel frauds (EUR 50 billion per year) and on the estimate of 20% margins on intra-community supplies. The definitive system would lead to a revenue loss in value of EUR 10 billion instead of EUR 50 billion because missing traders would not pay VAT on output but also would not have a right to claim input VAT. The tax revenue lost in such a case would only be the VAT from their margin and not the VAT calculated from the total value of the goods as in the current system[1]. However, MTIC fraud is not the only form of VAT evasion. There are also other types of fraudulent behavior, e.g., hiding taxable revenues, intentional use of lower rates,

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[1] In the current system, the intracommunity supply of goods is VAT exempt, and the missing trader does not incur any input VAT when purchasing the goods cross-border. Therefore, non-filing the tax return doesn't mean the loss of VAT deduction.

or avoiding the VAT registration (Tait, 1988, Keen and Smith, 2006). The implementation of the definitive VAT system would not solve these forms of VAT evasion. It is obvious that there would not be an equal benefit of the definitive system in all Member States because the additional tax revenues after its implementation would differ, inter alia, due to economy's business structure and the volume of VAT evasion caused by the MTIC fraud in each country.

Therefore, in our paper, we try to estimate potential additional VAT revenues for individual Member States in addition to calculating their change of administrative costs. The change in their administrative costs depends on the trade balance of that State with other Member States, as explained above. The increase in VAT revenues depends on the volume of carousel fraud present in that Member State. The result of the overall trade balance of the State with other Member States and MTIC fraud present in that State are not related in any way. However, they express the cost and benefit of the definitive system for each state. Therefore, we will analyze the position of each state in these two respects, and we are interested in whether the costs and benefits are correlated or whether some Member States incurred only costs whereas others only benefits.

3. Data and methods

This section shows data and explains methods used for the calculation of the definitive system's impact on each Member State. Firstly, the data used for the estimation of additional VAT revenue and the change of administration expenses are presented. Secondly, the chapter describes correlation analysis applied to find a relationship between additional VAT revenues and the change of administration costs.

3.1 Trade balances and their adjustments

For the purposes of our analysis, data from Eurostat's International trade in goods statistics (ITGS) were utilized. ITGS includes both intra-EU and outer-EU business transactions. The amounts of imported and exported goods per each state and year since 1988 are collected there (Eurostat, 2020a). We used only the data on exports and imports within the EU. In the terminology of VAT legislation, exports are called intra-community supplies, and imports are intra-community acquisitions.

Data of import and export should be adjusted for the purposes of our calculation. It is necessary to remove cross-border transactions, which would be exempted or not taxed in the VAT definitive system. These transactions can be found in the *Council directive on common system of VAT* (European Council, 2006) – further referred as VAT Directive.

Although the VAT Directive is not enforceable in Member States directly, every country is obliged to implement principles and the content of this Directive into its own legislation. Therefore, we assume that transactions formulated in the VAT Directive as non-taxable are treated so in all

Member States, and we removed them from the ITGS. To be precise, we focused on the phrase "Member States shall exempt" used by the Directive. In such cases, the goods are exempted across the EU and there are no doubts about taxing them. Oppositely, if the wording of the VAT Directive contains "Member States may exempt", we concluded not to remove the goods from the statistics. The reason is that the exemption of such goods is voluntary, and not all states apply that.

Based on article 132 of Directive, activities in the public interest are exempted. These activities include inter alia postal services, hospital and medical care, services of dental technicians, services of young people's education or specific culture services. Further, article 136 also exempts the supply of goods utilized solely for all exempted activities in the article 132. In other words, Member States are obliged to exempt, for instance, medical supplies.

Other exemptions are provided in article 148 of Directive, which focuses on the exemption of international transportation. Based on this article, the supply of goods for fueling, reparation, maintenance and provisioning of vessels used for selected purposes is exempted as the activities itself. The exemption is applicable by analogy for the supply of aircrafts, goods for its maintenance or their reparation.

We utilized two types of nomenclature to distinguish between taxed and non-taxed supplies. Firstly, the Classification of Products by Activity (CPA) nomenclature divides supplies according to NACE[2] activity, so one might distinguish supplies of medical care products for health care from supplies of medical care for wholesale. Secondly, the Standard International Trade Classification (SITC) nomenclature was employed to search for supplies on the lower levels of codes.

Both types of nomenclature show the data on a monthly basis in EUR currency. For the reason of clarity, we summarized outputs on an annual basis.

3.2 Administration costs

The difference in administration costs caused by the definitive VAT system can be quantified by *cost of collection* indicator. The cost of tax collection is annually calculated and reported by OECD (2020) and represents the value of administration costs incurred by the financial authorities per one unit of tax revenue (not only VAT but all taxes). The indicator is calculated as the ratio of annual costs of tax administration to net tax revenues collected during the respective year as follows.

$$\frac{Total\ costs\ of\ tax\ administration}{Total\ tax\ revenues - VAT\ on\ import} \qquad [1]$$

Equation [1] includes values in national currencies. To improve the comparability of results, VAT on imports is subtracted from total tax revenues in the denominator. Further, OECD (2020)

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[2] Nomenclature générale des Activités économiques dans les Communautés Européennes

multiplies the fraction by 100. For the purposes of our analysis, multiplication by 100 is not done so that the result represents collection costs per one currency unit of revenue.

Collection costs of tax administration can be useful for prediction of additional administration costs incurred in the definitive VAT system. Each state's additional costs can be calculated as the collection tax administration costs of each State multiplied by the expected amount of additional VAT collected by this Member State for another Member States. We calculate the difference in the tax administration costs from the amount of intracommunity supplies exceeding intracommunity acquisitions, as explained earlier. The reason is that under the current system, each state collects the VAT from the intra-community acquisitions and not from the intra-community supplies but in the definitive system, it will be exactly the opposite. To quantify the change in administration costs, we multiply the balance of intra-community supplies and acquisitions of each state by the average VAT rate in EU (used for simplification as explained in next section). Thus, we get the amount of VAT to be collected in addition to what was collected in the current system. These amounts are then multiplied by the tax administration collection costs of each State.

Even though such method of quantification is not perfectly accurate, it helps to demonstrate the effect of the definitive VAT system's implementation. The inaccuracy is caused by several factors. Firstly, we build the calculation on data of the current system where no payments between tax administrators take place (except of VAT collected from electronic, telecommunication and broadcast services). The process of payments might cause other additional costs that we are not able to predict. Secondly, tax administration costs reported by OECD (2020) are calculated per unit of overall tax revenue and not only VAT revenue. However, due to the lack of more precise data we use it for our calculation as an approximation of the costs of VAT collection. Furthermore, VAT collection costs are also influenced by other factors specific to VAT and different from other types of taxes, as for example the average length of the distribution chain in the economy or the use of a local reverse-charge mechanism.

3.3 VAT rates on cross-border transactions

To calculate additional costs incurred by definitive system, VAT rate is highly important as it serves for computation of additional payments collected and distributed to other Member States.

In our analysis, we utilized the arithmetic average of standard VAT rates applied in all Member States in 2017 (European Commission, 2020). Rates from 2017 were used to correspond to other data in the analysis that are last available in that year (but as Table 1 shows, they have not changed till 2019).

Table 1. Standard VAT rates (source: European Commission, 2020)

	2017	**2018**	**2019**
Belgium	21	21	21
Bulgaria	20	20	20
Czech Republic	21	21	21
Denmark	25	25	25
Estonia	20	20	20
Finland	24	24	24
France	20	20	20
Croatia	25	25	25
Ireland	23	23	23
Italy	22	22	22
Cyprus	19	19	19
Lithuania	21	21	21
Latvia	21	21	21
Luxemburg	17	17	17
Hungary	27	27	27
Malta	18	18	18
Germany	19	19	19
Netherlands	21	21	21
Poland	23	23	23
Portugal	23	23	23
Austria	20	20	20
Romania	19	19	19
Greece	24	24	24
Slovakia	20	20	20
Slovenia	22	22	22
United Kingdom	20	20	20
Spain	21	21	21
Sweden	25	25	25

The average VAT rate used for our analysis was calculated at 21.519 %. We realize that the use of the average basic rate is a great simplification, but in our opinion, it is sufficient for the preliminary calculation that we want to provide in this paper. For more accurate results in potential further research, we would suggest calculating the average effective VAT rate individually for each state according to its trade structure and VAT rates (both standard and reduced).

3.4 Estimation of MTIC fraud

For the calculation of additional VAT revenues, it is important to estimate the size of MTIC fraud because additional VAT revenues will be realized through the elimination or at least reduction of this type of VAT evasion. The value of MTIC fraud might be calculated from the VAT gap.

VAT gap means the difference between theoretical VAT liability and real VAT revenue (European Commission, 2016a). One of the VAT gap's components is MTIC fraud. Nonetheless, there are also other components, as for example, bankruptcy of businesses or mistakes in tax calculation. It is estimated that MTIC fraud represents approximately 36 % of the VAT gap in EU (European Commission, 2016a). The estimates are based only on data collected from a few countries. All Member States were asked to provide data on the share of MTIC fraud in their VAT gap. However, only nine countries were able to provide data in required detail. According to European Commission (2015), in some Member States the MTIC fraud is expected to be lower – approximately 20 %. A lower estimate also stems from the work of other authors (Borselli, 2015 or Poniatowski et al., 2016). Some other authors provided a calculation of MTIC fraud on certain goods or between individual countries (Stiller and Heinemann, 2019 or Vaškovič et al., 2021) using the discrepancies in trade balances. Furthermore, Stiller and Heinemann (2021), based on the analysis of reporting discrepancies in trade balances between Member States estimated MTIC fraud on electronic devices in the whole EU. However, these estimates are not available for all goods and all States. Therefore, we used extrapolation and weighted average to estimate the overall share of MTIC fraud on VAT gap at 24 %. This percentage was further applied to VAT gap in each Member State estimated for 2017 in CASE (2019). The use of the average share of MTIC fraud in the VAT gap is a limitation that could only be overcome with more detailed data from individual Member States. However, these data are not publicly available.

3.5 Correlation analysis

The relationship between the change in administration costs and the value of MTIC frauds might be appraised by correlation analysis. From the analysis, we will find out whether the States that will incur relatively more tax administrative collection costs are also states with higher MTIC fraud and thus higher additional revenues. This will help us to find out if Member States will be motivated to implement a VAT definitive system, because changing the VAT treatment on cross-border supplies of goods will increase their administrative costs but will also reduce their MTIC fraud and these costs and benefits are in balance. To determine the tightness of the dependence of those two variables, we chose Spearman's rank correlation coefficient, which can be expressed as

$$r_s = 1 - \frac{6 \sum_{i=1}^{n} d^2_i}{n \, (n^2-1)}, \; d_i = \left(i_x - i_y \right), \hspace{3cm} [2]$$

where the variables represent

$n \ldots number\ of\ observations$

$i_x \ldots order\ of\ the\ State\ according\ to\ the\ change\ in\ administration\ costs$

$i_y \ldots order\ of\ the\ State\ according\ to\ the\ value\ of\ MTIC\ frauds$

The Spearman's correlation coefficient is a non-parametric method that utilizes the order of variables' values. It is based on the calculation of statistical dependence between the rankings of

two variables. It assesses how well the relationship between two variables can be described using a monotonic function. The great advantage of this method lies in its broad applicability. It might be used for all types of linear or non-linear correlation and furthermore, there is no need for normal data distribution. Spearman's correlation coefficient is mostly used for variables that are expected to be non-linear or without normal distribution (Corder, 2014).

For the evaluation of correlation's statistical significance, we used hypotheses about the correlation coefficient. Hypothesis H_0 represents independence of between variables while alternative hypothesis H_1 means dependence (Hindls, 2007).

$$H0 = \rho_{yx} = 0; \; H1 = \rho_{yx} \neq 0 \tag{3}$$

Further, we calculated test criterion t, which was afterwards compared to a critical region on selected significance level $W\alpha$.

$$t = \frac{r_s}{\sqrt{1 - r_s^2}} \sqrt{n - 2}; \; W\alpha = \{t; |t| \geq t_1 - \alpha/2\} \tag{4}$$

where $t_1 - \frac{\alpha}{2}$ represents quantile of t-test with $n - 2$ degrees of freedom. We use a significance level α αof 5 % (i.e., 95% reliability), the critical value is given by the quantile $t_{0,975}(25) = 2,060$

4. Findings and discussion

This section provides our results and related discussion about the impact of the definitive VAT system on Member States. Firstly, trade balances of each Member State are calculated. Secondly, administration costs' change and additional VAT revenues are estimated. Thirdly, the results of correlation analysis between the change of administration costs and additional VAT revenues are provided.

4.1 Trade balances

Trade balances were calculated as the values of net supplies of each Member State to other Member States. The trade balances were adjusted by items deducted as non-taxable according to Directive. These items were about 2% of the total intra-community supplies and acquisitions.

Table 2 contains "net supplies" (analogy of net export or trade surplus) calculated for each Member State as the sum of intra-community acquisitions of goods from all other Member States subtracted from the total of intracommunity supplies of goods to all other Member States. In the last two columns, the countries are sorted by their net supplies in 2017 to get the overview of which State was the net biggest exporter (intra-community supplier) and which had the biggest imports (intra-community acquisitions)

Table 2. Net supplies after adjustments (EUR million).

Country	2019	2018	2017	2017	Countries (sorted by their trade surplus in 2017)
Austria	- 16,908	-16,525	-15,179	174,064	Netherlands
Belgium	28,333	26,145	25,641	25,641	Belgium
Bulgaria	-1,401	-1,312	-1,834	21,888	Ireland
Croatia	-9,353	-8,340	-7,758	20,887	Germany
Cyprus	-3,560	-3,669	-3,469	18,510	Czech Republic
Czech Republic	23,019	20,323	18,510	9,981	Poland
Denmark	-5,895	-7,106	-5,390	7,671	Hungary
Estonia	-2,317	-2,451	-2,390	3,474	Slovenia
Finland	-10,486	-10,373	-10,158	2,677	Slovakia
France	-116,548	-113,908	-113,055	-1,568	Malta
Germany	-1,515	10,572	20,887	-1,834	Bulgaria
Greece	-10,424	-10,325	-10,401	-1,995	Italy
Hungary	9,549	7,724	7,671	-2,390	Estonia
Ireland	31,284	26,431	21,888	-3,469	Cyprus
Italy	3,203	1,327	-1,995	-3,602	Latvia
Latvia	-3,881	-3,582	-3,602	-4,668	Lithuania
Lithuania	-4,642	-4,808	-4,668	-5,390	Denmark
Luxembourg	-6,040	-6,777	-6,029	-5,546	Spain
Malta	-1,619	-2,050	-1,568	-6,029	Luxembourg
Netherlands	181,915	184,964	174,064	-7,758	Croatia
Poland	19,155	12,426	9,981	-10,158	Finland
Portugal	-14,004	-14,086	-13,771	-10,401	Greece
Romania	-12,284	-10,857	-10,491	-10,491	Romania
Slovakia	311	2,173	2,677	-13,771	Portugal
Slovenia	4,411	4,276	3,474	-15,179	Austria
Spain	-3,258	-5,983	-5,546	-18,670	Sweden
Sweden	-17,502	-17,975	-18,670	-113,055	France

Note. Source: Eurostat (2020) and own calculation.

A positive value of net supplies represents a higher number of intra-community supplies than intra-community acquisitions. In such a case, the Member State would, after the implementation of the definitive system, collect VAT from B2B intra-community supplies for other states, which will be higher than the VAT collected from B2B intra-community acquisitions in the current system. Therefore, States with the highest trade surplus as Netherlands, Belgium, Ireland, Germany and Czech Republic would incur more administrative costs caused by a definitive VAT system compared to the administrative cost that they are spending now. The impact of a definitive system would not be equal for all Member States, and countries with positive trade balances would have the worse administrative position.

In the left part of Table 2, trade balances are calculated for three consecutive years (2017, 2018, 2019) to ascertain the trend. Most of the countries remain at either negative or positive values, except for Italy and Germany. As for Germany, B2B intra-community supplies exceed

acquisitions in 2017 and 2018. In 2019, Germany reached higher intra-community acquisitions than supplies. In the case of Italy, there were higher intra-community acquisitions than supplies in 2017. For the next two years, intra-community supplies exceed acquisitions.

From the last two columns, it can be observed that Intra-community supplies predominate in the case of Belgium, the Czech Republic, Hungary, Ireland, the Netherlands, Poland as well as Slovakia and Slovenia. These states are expected to have a worse administrative position in the definitive VAT system since they would have a higher administrative burden caused by the additional collection of output VAT on intra-community supplies for another Member States.

The greatest difference between intra-community supplies and acquisitions is in the Netherlands. In the long term, the Netherlands has higher intra-community supplies than acquisitions by approx. EUR 181 billion. Thus, it is expected that the Netherlands would encounter the highest increase of administration costs in the definitive VAT system. On the contrary, France would improve its position as it has on average about EUR 116 billion surplus in intra-community acquisitions.

4.2 Change in administration costs

Based on the results above, we analyze which countries would incur higher administration costs in the definitive VAT system and which countries will, on the contrary, reduce their tax collection costs. Table 3 shows the estimates of the change in administrative costs for all Member States in 2017. The second column displays the change in VAT collected by Member States under the definitive system calculated as net supplies multiplied by the average VAT rate. The third column shows tax collection costs per unit of revenue. Unfortunately, the data about the cost of collection are not available for Hungary, Poland, and Slovakia. To estimate the change in tax administration costs in those three Member States, we calculated average tax collection costs amounting to 0.0078 based on the values for all other 24 states.

The fourth column displays the final estimation of the change in tax administration costs caused by the implementation of the definitive VAT system. The estimation is based on the change in the amount of administered VAT and actual tax collection costs in each state. It is necessary to remark that slightly higher costs should be expected since the definitive system would also require new operations (such as forwarding of payments among tax administrators).

The highest benefit of VAT system's transformation would experience France. France has the lowest net supplies in the EU connected to an above-average cost of collection (0.0090). Generally, if the state with negative net supplies also has a high value of collection costs, it would benefit even more. The reason is that the tax, which is now collected not efficiently by such a state, would be collected by another Member State.

Table 3. Change in administration costs.

Country	VAT administered for other member states (EUR million)	Cost of collection	Change in administration costs (EUR million)
Netherlands	37,456	0.0076	286
Germany	4,495	0.0137	62
Czech Republic	3,983	0.0132	53
Belgium	5,518	0.0092	51
Ireland	4,710	0.0055	26
Poland	2,148	0.0078	17
Hungary	1,651	0.0078	13
Slovenia	748	0.0068	5
Slovakia	576	0.0078	4
Malta	-337	0.0042	-1
Estonia	-514	0.0033	-2
Italy	-429	0.0084	-4
Bulgaria	-395	0.0100	-4
Denmark	-1,160	0.0052	-6
Latvia	-775	0.0081	-6
Lithuania	-1,004	0.0070	-7
Cyprus	-746	0.0105	-8
Spain	-1,194	0.0069	-8
Luxembourg	-1,297	0.0079	-10
Croatia	-1,669	0.0072	-12
Sweden	-4,018	0.0035	-14
Finland	-2,186	0.0065	-14
Greece	-2,238	0.0064	-14
Romania	-2,258	0.0080	-18
Austria	-3,266	0.0084	-27
Portugal	-2,963	0.0113	-33
France	-24,328	0.0090	-219
Total			110

Note. Source: OECD (2020) and own calculation.

Highlighted countries in the table are expected to experience an increase in administrative costs after the implementation of the definitive VAT system. The greatest rise of administration costs would occur in the Netherlands, followed by Germany, the Czech Republic and Belgium.

Collection costs play a significant role in determining the change in administration costs. The high value of collection costs causes an increase in the final effect, as can be seen in Table 3. This explains why the Czech Republic should expect more additional administration costs than Belgium and Ireland although their trade balances show that they will administer more VAT for other countries.

As the results are calculated for all Member States, it is possible to estimate the final change in administration costs across the EU as EUR 110 million (sum of the last column totalling the

changes in all member states). This calculation is, however, not precise as we expect higher additional costs due to new operations and services, as, for example, cross-border payments' settlement between Member States.

Table 3. VAT gap and estimated value of MTIC frauds.

Country	VAT Gap (EUR million)	MTIC frauds (EUR million)
Italy	33,629	8,071
Germany	25,016	6,004
France	12,030	2,887
Greece	7,399	1,776
Romania	6,413	1,539
Poland	5,764	1,383
Belgium	3,996	959
Netherlands	2,744	659
Austria	2,444	587
Denmark	2,235	536
Czech Republic	2,082	500
Ireland	1,938	465
Portugal	1,929	463
Hungary	1,893	454
Spain	1,806	433
Slovakia	1,791	430
Finland	1,622	389
Lithuania	1,119	269
Sweden	654	157
Bulgaria	625	150
Croatia	459	110
Latvia	385	92
Slovenia	128	31
Estonia	122	29
Luxembourg	23	6
Cyprus	11	3
Malta	13	3
Total		28,385

Note. Sources: CASE, 2019; European Commission, 2015; own calculation)

4.3 Additional VAT revenues

Additional revenue in the definitive VAT system would be caused by eliminating MTIC frauds. Thus, calculation of additional VAT revenue requires evaluation of MTIC frauds. Table 4 displays VAT gaps according to CASE (2019) for 2017 and our estimated value of MTIC frauds. As explained earlier, MTIC fraud is estimated based on Commission's study (European Commission, 2015) as 24 % of each Member State's VAT gap.

Results vary among all Member States. Based on our calculation, the highest savings are expected in Italy (EUR 8 billion). The lowest additional revenue would experience Cyprus and Malta (EUR 3 million). Total additional VAT revenues in the EU would be EUR 28 billion in 2017.

4.4 Correlation analysis and overall impact on Member states

The change of administration costs and potential VAT revenues that would result from the definitive VAT system should be compared to find out whether the definitive system is suitable for individual members and the European Union as such.

From the point of view of individual States, their net proceeds from the new system can be calculated if we subtract the change in administrative costs from the additional VAT revenues (which are equal to the Member States's size of MTIC fraud). From the last two columns of Table 5, it can be concluded that the new system is beneficial for all countries because the resulting proceeds of the definitive system are positive. This results from the fact that the MTIC fraud (i.e., expected additional VAT revenue) is much higher than the expected change of tax administration costs. Best results are achieved by Italy, Germany and France, which get the highest proceeds from the new system. This is caused by the size and volume of MTIC fraud that is eliminated by the definitive system. On the other side of the spectrum, there are small countries as Malta, Cyprus or Luxemburg that will have the least benefit from the new system.

Furthermore, we want to assess the fairness of the implementation of the system for the EU as a whole because the costs and benefits of the system are not distributed evenly as explained above. To get an answer, the correlation analysis between the change of the tax administration costs and the estimates of MTIC frauds, i.e., a potential increase in VAT revenues, was performed. Ranking of Member States for the correlation analysis are shown in the left part of Table 5 below. Both variables (change in administrative costs and value of MTIC frauds) were arranged from the highest to lowest value, and according to their position in a row, the variables i_x and i_y are the positions of the States based on their values of the change of tax administrative cost and MTIC fraud.

Spearman's coefficient is further calculated according to equation 2 as:

$$r_s = 1 - \frac{6*3,056}{27\,(27^2-1)} = -0.0672 \qquad [5]$$

Since the value of Spearman's coefficient approaches zero, variables are independent. Independence might be verified by test of hypothesis on correlation coefficient. If we substitute variables in Equation 4, we get test criterion

$$t = \frac{-0.0672}{\sqrt{1-(-0.0672)^2}} \sqrt{27-2} = -0.3365 \qquad [6]$$

Table 4. Correlation analysis and net impact of the definitive system on Member states

Country	Change in administrative costs (EUR million)	Value of MTIC frauds (EUR million)	i_x	i_y	d_i $(i_x - i_y)$	d^2_i	Countries ranked according to net proceeds from the Def. system	Net proceeds from the Definitive system
Austria	-27	587	25	9	16	256	Malta	4
Belgium	51	959	4	7	-3	9	Cyprus	11
Bulgaria	-4	150	13	20	-7	49	Luxembourg	16
Croatia	-12	110	20	21	-1	1	Slovenia	26
Cyprus	-8	3	17	27	-10	100	Estonia	31
Czech Republic	53	500	3	11	-8	64	Latvia	98
Denmark	-6	536	14	10	4	16	Croatia	122
Estonia	-2	29	11	24	-13	169	Bulgaria	154
Finland	-14	389	22	17	5	25	Sweden	171
France	-219	2,887	27	3	24	576	Lithuania	276
Germany	62	6,004	2	2	0	0	Netherlands	373
Greece	-14	1,776	23	4	19	361	Finland	403
Hungary	13	454	7	14	-7	49	Slovakia	426
Ireland	26	465	5	12	-7	49	Ireland	439
Italy	-4	8,071	12	1	11	121	Hungary	441
Latvia	-6	92	15	22	-7	49	Spain	441
Lithuania	-7	269	16	18	-2	4	Czech Republic	447
Luxembourg	-10	6	19	25	-6	36	Portugal	496
Malta	-1	3	10	26	-16	256	Denmark	542
Netherlands	286	659	1	8	-7	49	Austria	614
Poland	17	1,383	6	6	0	0	Belgium	908
Portugal	-33	463	26	13	13	169	Poland	1366
Romania	-18	1,539	24	5	19	361	Romania	1557
Slovakia	4	430	9	16	-7	49	Greece	1790
Slovenia	5	31	8	23	-15	225	France	3106
Spain	-8	433	18	15	3	9	Germany	5942
Sweden	-14	157	21	19	2	4	Italy	8075

Note. Source: CASE (2019), EY (2015), and own calculation.

For significance value of 5%, critical value is represented by quantile:

$$t_{0.975}(25) = 2.060 \hspace{4cm} [7]$$

Considering test criterion, $|-0.3365| < 2.060$, we cannot reject hypothesis H_0 that the two variables are independent. We can therefore conclude that the introduction of the definitive system is good for the EU as a whole, but there is no balance (correlation) between the costs and benefits of the system for individual Member States. Some states will invest more in the new system than others.

5. Conclusion

Definitive VAT system primarily aims to reduce MTIC fraud, but it should be noted that this system also causes additional burdens and financial costs, especially for Member States, which are supply-oriented in the EU market. The reason is that VAT from B2B cross-border supply would be collected in the country of origin and then forwarded to the country of consumption. Member State from which the goods are delivered is responsible for the process of payment and forwarding the VAT on B2B intra-community supplies. That would cause additional administration costs for the financial authorities of that state (state of origin). In the current VAT system, Member States collect VAT on the B2B acquisition of goods from other Member States, while in the new system, they will collect VAT on the B2B supply of goods to other Member States. Therefore, administrative costs will increase in countries that are net exporters.

Based on our analysis, it was ascertained that a higher additional administration burden might arise in the Netherlands, Germany, the Czech Republic, Belgium, Ireland, Poland, Hungary, Slovenia, and Slovakia. These Member States would experience an increase in tax administration costs because their intra-community supplies exceed intra-community acquisitions.

According to our calculations, the total increase in tax administration costs in all Member States together is expected to be approximately EUR 110 million (see Table 3). This value can be characterized as the lowest value possible generated by the definitive VAT system because costs of new processes and operations (inter alia, settlement of payments between Member States or control of refunds paid to businesses purchasing goods from other Member States) are not involved in our analysis.

Additional VAT revenues that could be generated thanks to the VAT definitive system are equal to the value of eliminated MTIC frauds. Total additional VAT revenues across the EU are estimated as EUR 40 billion, according to European Commission (2017a). This calculation was based on the estimate of the VAT gap from another study of the Commission (European Commission, 2015). Since then, the VAT gap has decreased across the EU thanks to various measures fighting against VAT fraud (for example, reverse charge applied by many Member States on risk commodities). Therefore, potential additional VAT revenue would be nowadays

lower than in 2015, they would reach EUR 28 billion in 2017 (see Table 4) and would still be in billions of EUR in the year 2021. Additional revenues would certainly exceed the additional administrative costs that we calculated.

It is clear from the net proceeds of the individual Member States (in Table 5) that not all countries would benefit to the same extent from the definitive system. Italy, France and Germany would gain the most. Malta, Cyprus and Luxemburg would have the least advantage from the system in absolute terms due to their small volume of MTIC fraud.

If only these two factors are considered, the definitive VAT system would be advantageous for the European Union. Nonetheless, benefits for Member States are not balanced since there is no correlation between benefits (the additional VAT revenues) and costs (additional administration costs) incurred by them. To implement the definitive VAT system, a unanimous agreement of all Member States is necessary. Therefore, we would recommend some sort of compensation of additional administrative costs for the Member States with a worse administrative position.

We also find it necessary to emphasize that there are also other aspects of the definitive VAT system that should be evaluated to be able to decide about its implementation. For instance, the change in cash-flow of businesses and their higher compliance costs on cross-border transactions could have a negative impact on cross-border trade in Single Market or increased compliance costs for business.

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