
Household Consumption and VAT Revenue in Poland

Submitted 22/09/20, 1st revision 03/10/20, 2nd revision 16/10/20, accepted 22/11/20

Janina Kotlińska¹, Marian Żukowski², Paweł Marzec³, Jarosław Kuśpit⁴,
Zdzisław A. Błasiak⁵

Abstract:

Purpose: Examine dependencies between the size and the structure of directional household expenditure on consumption and the amount of VAT tax revenue for the state budget in Poland, in connection with the explanation of fluctuations of households' VAT contributions per capita.

Design/methodology/approach: The study used the following methods: literature review, methods applied in descriptive statistics, linear models of multiple regression, factor analysis using the method of main components, and a single-factor variance analysis (ANOVA). Detailed analyses were conducted based on own calculations using analytical software SPSS (Predictive Solutions), Statistica and MS Excel calculation sheet.

Findings: Our results show: 1) household consumption, understood as incurring expenses to purchase goods and services which takes place in the economy of a state, is the principal creator of state budget revenue based on VAT; 2) the level of VAT revenue from household consumption depends on the financial resources at the households' disposal, the way they spend them and the structure of such expenditure; 3) households are very diverse internally, while the size and structure of their purchases varies in time and is determined by many factors; 4) a diversified rate of VAT on particular goods and services purchased by households has a major impact on the level of state budget revenue from VAT returns; 5) financial transfers to households, which express a variety of social policy instruments applied by the state, including the pro-family policy, result in the increase of the state revenue from VAT; the effectiveness of such transfers – both for the realisation of state policy, as well as the increase of its tax revenue – can be stimulated by the appropriate matrix of VAT rates; 6) the limited availability or the lack of particular statistical data regarding the VAT burden on household expenditure, and the structure of state budget revenue based on VAT in the cross-section of tax rates, decreases analytical potential and the possibilities of drawing conclusions.

¹Professor, Katolicki Uniwersytet Lubelski Jana Pawła II, Wydział Nauk Społecznych, Instytut Ekonomii i Finansów, Katedra Finansów i Rachunkowości, e-mail: jankakotlinska@kul.pl;

²Professor, Katolicki Uniwersytet Lubelski Jana Pawła II, Wydział Nauk Społecznych, Instytut Ekonomii i Finansów, Katedra Polityki Gospodarczej i Bankowości, e-mail: marian.zukowski@kul.pl;

³Professor, same as in 2, e-mail: pawelmarzec23@kul.pl;

⁴Katolicki Uniwersytet Lubelski Jana Pawła II, Wydział Nauk Społecznych, Instytut Ekonomii i Finansów, Katedra Polityki Gospodarczej i Bankowości, e-mail: jkuspit@kul.pl;

⁵Katolicki Uniwersytet Lubelski Jana Pawła II, Wydział Nauk Społecznych, Instytut Ekonomii i Finansów, Katedra Finansów i Rachunkowości, e-mail: adamb@kul.pl;

Practical Implications: *The conclusions drawn from the conducted analyses and research can be useful for the state when selecting the tools which not only will allow for the increase of its budgetary revenues, but also the effective realization of the aims of its social policy.*

Originality/value: *Extending the research on VAT with the analysis of the tax potential of households' purchasing decisions with the inclusion of the VAT matrix as well as the fiscal and non-fiscal objectives of state policy. The proposed methodological path allows for its popularisation with the use of panel data.*

Keywords: *State budget revenue, VAT, households, consumption, state policy objectives.*

JEL codes: *D11, D14, D31, E21, E62, G38, H24, H31, H72, J38, R20.*

Paper type: *Research article.*

1. Introduction and Literature Review

The research on the problems concerning value added tax (VAT, sometimes referred to as tax on goods and services) is conducted in two ways, i.e. by highlighting the international diversification of transactional environment and by concentrating on domestic issues. The former is dominated by comparative studies (Cnossen, 1998; Bird and Gendron, 2007; van Brederode and Krever, 2017) and those addressing the problem of harmonizing taxation (Frenkel, Razin, and Symansky, 1991; Genser, 2003; Drăcea, Buziarnescu, and Florea, 2013; Olexová and Hust'ák, 2018), while the latter considerations are varied, but their majority focus on the issues of dependencies between the overall shape of a tax system, including taxes on consumption, and economic growth. The still valid model summary of interactions in this respect was provided by Engen and Skinner (1999), and Myles (2000).

Further details for their studies concern both specific domestic conditions (Spirakis and Sarantidis, 2017; Urişescu, 2018) as well as verification of theses related to economic theory (Fisher and Hofm, 2000; Zhang, Davies, Zeng, and McDonald, 2007), including an interdisciplinary area linked with social status and theory of wellbeing (Rauscher, 1997; Chang, 2006; Bye, Strøm, and Åvitsland 2011). A separate group in this research concerns the analyses of taxing consumption and directly VAT (Alm and El-Ganainy, 2013), the majority of which address systemic effectiveness (Richter 2000; Keen 2007; Harju, Kosonen, and Ropponen 2014; Cupák and Toth 2017; Lyssioutou and Savva 2020), changes to the elements of the tax structure and reactions to those (Barrell and Martin 2009; Harju, Matikka, and Rauhanen 2016); the taxation gap and tightening the system of taxation (Trandafir, 2016; Nerudova and Dobranschi, 2019; Sarnowski and Selera, 2019), sometimes concentrating their attention on problems regarding certain areas, e.g., the publishing market (Borowiecki and Navarrete, 2018), popular culture (Ateca-Amestoy, Gardeazabal, and Ugidos, 2020), or home-made food (Ferri, Molto, and Uriel, 2009).

A specific point of reference for these studies are the analyses of taxing household consumption, in which the dominating implication under analysis is the reaction of households to changes in the system of taxation (Bedau, 1996; Cashin, 2017), especially in relation to progressive or regressive VAT (Arsić and Altiparmakov, 2013). However, in the above-mentioned studies the authors do not address the issue, which can be described as the tax potential of consumption decisions in households, including that connected with VAT. This research gap existing in the literature suggested to the authors of this paper to make it the subject of their analysis.

2. VAT in the Polish Tax System

The tax system in Poland was shaped in the early 1990s when, following the period of the centrally managed economy and the transformation of the system, a free-market economy was being introduced. Bearing in mind the prospect of the accession to the European Union, fundamental changes were applied to the taxation of private individuals (in 1991), then to tax on the income of legal entities (1992), and a year later – tax on consumption.

The tax system of a member state has to be coherent with the solutions existing in other EU countries, and this was reflected in the processes of harmonization (McCreevy, 2005) which were intended to lead to a widespread socio-economic integration. Within the EU, the high degree of harmonization regards in particular VAT and excise duty (Bukowski and Kaczmarczyk, 2007; Kostecki, 2004; Kudła, 2006; Pomorska, Szolno-Koguc, and Wójtowicz, 2003).

Value-Added Tax introduced in Poland in 1993, was a new construct, different from the then existing sales tax which was applied only to consumer goods. The mechanism of calculating that tax highlighted its neutrality from the viewpoint of international exchange (0% rate for exports of goods and services), number of stages in trading goods, and their impact on the final prices of goods/services through the elimination of an accumulation of costs (which was a characteristic of the sales tax). This was beneficial for the competitiveness of highly-processed Polish products on international markets.

Further changes in the construction of the analysed tax occurred following Poland's accession to the EU (May, 2004). As a consequence the subject of this tax was extended to include both intra-EU supplies and intra-EU purchase of goods and services. These regulations came into force in the EU in 1993, introducing a hybrid solution in tax on sales, based on the application of both the principle of designation (in trade among taxpayers), and the principle of origin (in cases of supplies realised on behalf of consumers) (Agha and Haughton, 1996; Baltagi, 2008). The indicated changes resulted in the increased competitiveness of Polish products in the EU and also increased VAT revenue.

3. Determinants of VAT Revenue

VAT is used in more than 130 countries and constitutes a source of around 20% of global tax revenues (Keen and Lockwood, 2007). The research, carried out in a group of 143 countries over a period of 25 years, indicates that its introduction was determined by numerous factors. This had a significant, although diverse impact on the level of budget revenues of those countries, and in the majority of them proved to be a more effective instrument than those previously applied (Keen, Lockwood, 2010). In Poland, apart from two types of income tax (PIT – from private individuals, and CIT – from legal entities), excise duty and tax on gaming, VAT remains the most fiscally effective type of tax, as well as the main source of financing public expenditure (Kotlińska, 2018), as was confirmed by the data presented further on in this paper.

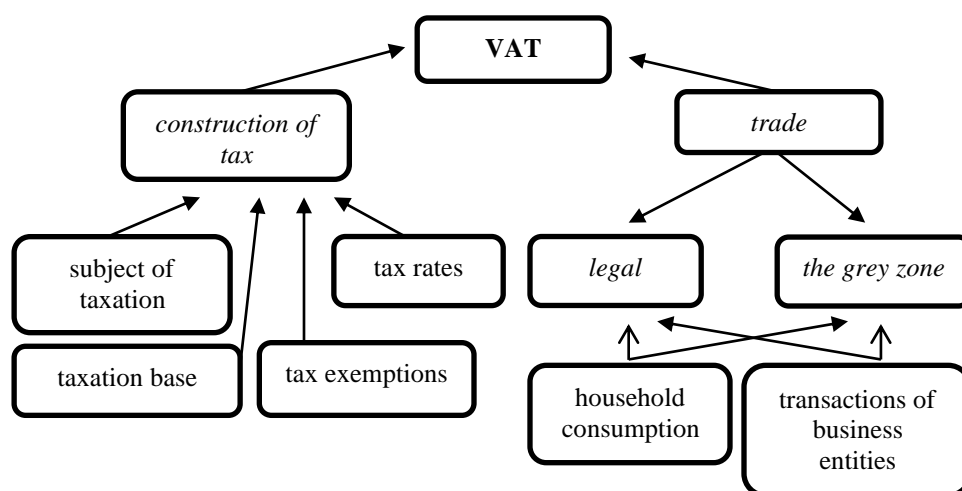
The revenue from VAT is determined by many factors (Figure 1), while it is decidedly decreased by trade taking place in the grey zone of the economy, influenced by the behaviour of both commercial enterprises and households. This phenomenon is referred to as the VAT gap, whose value for the EU was estimated in 2017 at approximately EUR 137.5 bln (CASE 2019). The authorities of individual countries strive to reduce the size of the grey zone and limit the scale of tax avoidance and fraud. An example of such attempts were the changes in legal regulations introduced in Poland in 2015-2017, which involved the introduction of the split payment mechanism (Ustawa, 2017), the uniform control file [Jednolity Plik Kontrolny] (Ustawa, 2015) and the package of solutions for tighter control (Ustawa, 2016; Sarnowski and Selera, 2019a; 2019b).

Sometimes the reduction of the grey zone occurs as a side effect of other processes taking place in the economy, as was in the case of Greece during the financial crisis and the accompanying restrictions in cash transactions (Thalassinos *et al.*, 2015). As a result of the estimations for the parameters of the model based on quarterly estimations 2003q4–2016q2, using the Kalman filter it was shown that a 1% growth in the share of payments made by credit cards in individual consumption – owing to the transparency of transaction cash flows – resulted in approximately a 1% higher tax revenue (Hondroyiannis and Papoikonomou, 2017).

Among the elements of the taxation technique, essentially there are four which have the strongest impact on the amount of VAT revenue, as shown in Figure 1. A uniform subject of taxation and the way of defining the tax base have not yet been established for the entire EU, and due to diversity of currency systems in operation in EU countries there are important differences in the exchange rates applied in international transactions. Such uniformity does not function in relation to taxation rates and exemptions, which significantly determines the level of VAT revenues for budgets of these states.

The introduction of Value-Added Tax and the activities aimed at harmonizing this tax within the EU started at the end of the 1960s. Along with the process of the ongoing integration as well as the territorial expansion of the EU, several changes and amendments in legal regulations also took place (Oręziak, 2009). Finally, in 2006 the Directive 2006/112/EU Council dated 28 Nov 2006, put in order the regulations in this scope. An example of the lack of uniformity in respect of the subject of taxation are the regulations which allow Member States to introduce special simplifying solutions for small enterprises, one of which is the possibility of being exempt from paying VAT in cases where the annual turnover does not exceed the defined level.

Figure 1. Determinants of VAT revenue



Source: Own elaboration.

Regarding rates of taxation, EU regulations stipulate the basic VAT rate (however, in order to avoid distorting competition this should not be lower than 15%) and a maximum of two reduced tax rates (treated as tax rebates), whose level is not subject to harmonization (a reduced rate not lower than 5% for strictly defined goods and services), which are complemented by special rates. In 1993, the basic rate of VAT in Poland (22%) was among the highest in EU countries, where the prevailing rate was 17%. The current (in 2020) basic rate in Poland (23%) is not among the highest since it falls between 17% (Luxembourg) and 27% (Hungary), while the reduced rates amount to 5% and 8% (previously 3% and 7%, respectively).

However, the choice of which goods and services are subject to a given rate results from the so-called matrix of VAT rates which is adjusted periodically. The last such change in Poland occurred at the beginning of July 2020, resulting in diversified price changes. Decidedly lower rates apply to food and non-alcoholic drinks (in Poland 5%, while the EU average exceeds 8%, oscillating between 0% in Ireland and 21% in Lithuania and Latvia), whereas the highest are for alcoholic drinks (in

Poland 23%, the EU average at just over 21%; the lowest average retail price for alcohol is applied in Luxembourg – 17%, and the highest, 25%, in Croatia and Sweden), shoes and clothing, as well as communication services (in Poland 23%, the EU average around 21%, while the lowest average rate is in Luxembourg – 17%, and the highest in Hungary – 27%). The existence of reduced VAT rates in all EU countries suggests their use for non-fiscal purposes.

VAT taxation occurs together with the spending which depends on the market activity of businesses as well as private households. Whereas the former are usually VAT payers, the latter, i.e. households, are the main consumers in the market together with government institutions, non-profit organizations, public housing institutions and foreign tourists (Reckon, 2009) and only bear its burden, which is visible in the construction of the prices of the goods and services they purchase. The purchasing activity of all the indicated subjects, which is worth emphasising, in the end does not have to create revenue from that tax. If it takes the form of non-documented trade in the system of VAT, it constitutes the grey zone and thus contributes to creating a taxation gap which individual countries try to reduce through tightening up their tax systems, which is possible owing to the tools applied to VAT payers who carry out transactions among themselves. However, these tools may be less effective when one of the parties involved in a transaction is a private household. Apart from the purpose of being protected by a warranty, its members may not be interested in documenting the receipt of the delivered goods/services rendered, which is advantageous for suppliers/service providers by lowering their duties concerning income tax and the value of VAT owing.

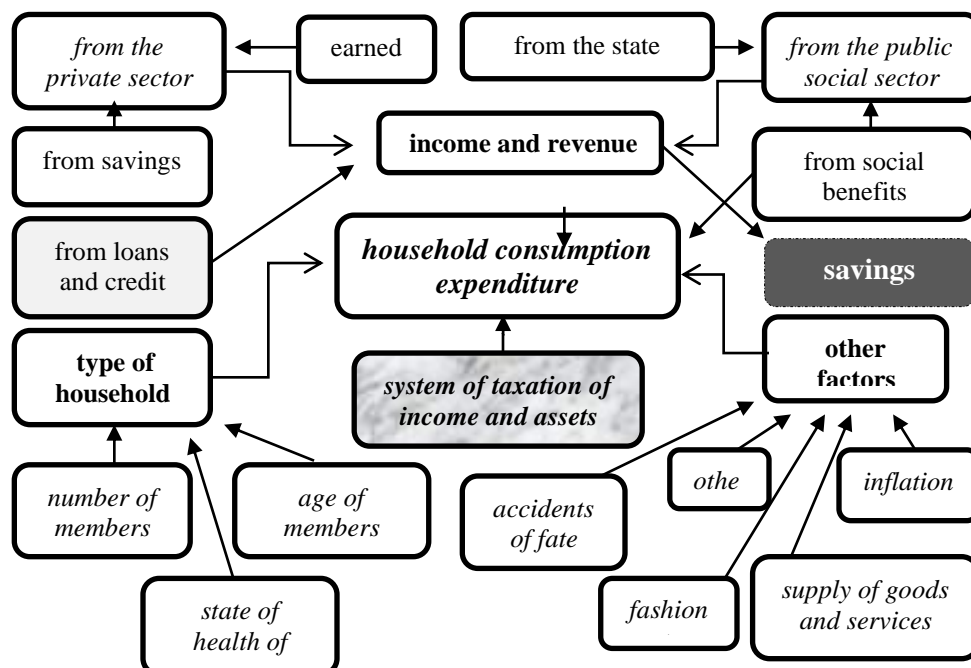
4. Household Spending as a Source of VAT Revenue

The key aspect regarding the amount of VAT revenue is the behaviour of households, as in Poland they generate state budget revenue at the level of at least 67% (Myck, Kundera, Najsztub, and Oczkowska, 2015; Barbone, Bonch-Osmolovskiy, and Poniatowski, 2014). Moreover, in contrast to business entities, their market presence is more durable and is expressed mainly by a continuous and merely fluctuating consumption, which never amounts to zero. State budget revenue comes from transactional expenditure from households' financial resources. As shown in Figure 2, the resources which are put aside, and therefore are temporarily withdrawn from circulation, reduce that revenue. Hence it is worth analysing and comparing the purchasing activity of households which impacts on changes in the state budget revenue related to VAT. Its mechanism is based on transferring the tax burden onto the consumer/end-user of a product/service since it is included in its price. In this case a seller becomes a kind of a middle-man, who only transfers the VAT paid by the customer to the state budget (data from the examined period are presented in a further section of this paper).

Households' expenditure depends on their currently available financial resources whose amount is closely linked to the type of professional activity, or the lack of it,

of household members (employees, entrepreneurs, farmers, pensioners, recipients of disability benefits), their credit rating and credit activity, as well as their ability and inclination to save money. Their financial resources can be provided by their current employment, either legal or in the grey zone (undocumented income), legal employment in the past (pension), accumulated savings (capital and interest), their current social situation (e.g. giving birth; bringing up a child; a child starting school; reaching the age of 75; death of a close relative/spouse), fulfilling a function which gives them a legal right to a due payment of social benefit or remuneration from public funds. Thus the earning potential or the possibility of obtaining income by household members are limited, variable over time, and depend on – among others – type of employment (e.g. seasonal work) or conducted business activity (e.g. farming), age and state of health. The level of the individual type of income and earnings is often strictly defined, non-flexible and not dependent on the current activities of the persons in question (public sector salary structure, hourly rates paid for work, amount of the received pension and health benefits), as well as spatially diversified (Owsiak, 2017). There is certain lack of clarity as to the remuneration of household members employed in the private sector since the actual paid-out amount may differ from the official book-keeping records of their employer.

Figure 2. Determinants of household consumption expenditure



Source: Own elaboration.

As much as the income generated by households remains limited, there are no limits to the potential possibilities of spending accumulated financial resources. In this

case, consumption is one of the options (whereas the others are e.g. saving, paying taxes). Individual households allocate different amounts of their available financial resources for consumption, in particular for buying food (Engle's law). There are many determinants which are strictly correlated – apart from the already indicated factors defining the levels *per capita* in a household – with the number of persons in a household, their health, age, habits and purchasing choices they make. Here it is not possible to disregard the changes in inflation rate, availability of certain products or services, fashions, the effect of copying and showing-off, the power of advertising and marketing techniques used by sellers, unforeseen events (accidents of fate, contagious diseases, armed conflicts, terrorist attacks), as well as instruments of state policy which direct and have an impact on increasing shopping or reducing its scale.

From the viewpoint of the fiscal aim of VAT taxation, apart from the scale of household expenditure on consumption, another important aspect is its structure expressed by the amount of financial resources allocated to purchasing certain groups of goods and services, and reflecting the so-called shopping goals. As was already mentioned, in every country, apart from the basic rate of VAT there are also in use reduced rates, which should result in the fact, that increasing expenditure on the purchase of goods/services taxed with a higher rate, will increase the state budget revenues because of it. However, a detailed study in this respect is hampered by the fact that the matrix of VAT rates has been changing over the years, resulting in an increase of some of them and a decrease in others in respect of the specific goods/services, and thus only averaged values can be used here.

For example, in the period 2008-2016 the highest average rates of VAT in Poland applied to shoes and clothing (approximately 22.7%, while for the rest of the EU it was 20.9%), alcohol and tobacco (22.7%, average for the EU – 18.5%), communication services (22.6%, and 18.0%, respectively), household furnishings and fittings (22.1% and 18.0%), transport services (19.8% and 17.0%), culture and recreation services (17.5% and 14.4%), energy production (14.9% and 8.3%), restaurant and hotel services (12.8% and 14.7%). Much lower rates applied to healthcare services (11.4% and 9.2%, respectively), food and non-alcoholic drinks (5.7% and 7.9%). Importantly for these considerations, in recent years the average rates of VAT in Poland were raised for culture and recreation services, as well as for restaurant and hotel services (just as in the rest of the EU), and reduced for food (in line with the rest of the EU) and energy (the whole of the EU shows an increase in this respect).

5. Methodology of Research on the Impact of Household Consumption Choices on the State Budget VAT Revenue

Household transactional decisions, which can be analytically reduced to expenditure in the identified subject categories, generate VAT transfers. The research focused on explaining the variability of the average monthly contribution in this respect in a household per capita, based on the share in total expenditure in detailed categories

decomposing the aggregate data recorded in relevant databases. For this purpose the following were used:

- 1) processed and aggregated data series, from 2000-2019 (2019 estimates), in income and consumption of households, derived from their surveys under the project: Household Budget Survey (HBS; Methodological report, 2018), not published for primary data,
- 2) data from national accounts, obtained from the official statistics of the Central Statistical Office (Statistics Poland) for the period 2000-2018, supplemented for 2019 by estimates by Statistics Poland and the relevant ministries in the area of state budget revenues,
- 3) the VAT gap estimates from the Eurostat research project dedicated to this, complemented by estimates from the Center for Social and Economic Research (CASE) coordinating its implementation (the research methodology is described in: *Fiscalis Tax Gap Project Group, 2016*, and detailed analyses are presented in CASE publications: <https://www.case-research.eu>).

In order to study the importance of Value-Added Tax revenues in the state budget income in Poland, their dynamics as well as changes in household consumption expenditure, the methods of descriptive statistics of selected values were applied, then deepened by regression analysis, factor analysis and one-way analysis of variance (ANOVA).

The average monthly VAT burden on household members (per capita) per year is defined in connection to the determined average effective tax rates calculated (based on Eurostat data for the period 2008-2016⁶) consistent with the COICOP/HBS (Classification of Individual Consumption by Purpose Adapted to the Needs of Household Budget Surveys) categories included in the HBS: food and non-alcoholic beverages (C1 - with an effective average rate of 5.7%), alcoholic beverages and tobacco products (C2 - 22.7%), clothing and footwear (C3 - 22.7%), housing, water, electricity, gas and other fuels (C4 - 14.9%), furnishings, household equipment and routine household maintenance (C5 - 22.1%), health (C6 - 11.4%), transport (C7 - 19.8%), communications (C8 - 22.6%), recreation and culture (C9 - 17.5%), education (C10 - 0%), restaurants and hotels (C11 - 12.8%) and miscellaneous goods and services (C12 - 16.7%).

Their determination made it possible to separate the average VAT tax contribution in the individual categories, which, after being supplemented by a tax contribution (not subject to further examination) within the expenses recorded outside the listed categories (for which 16% taxation was assumed, i.e. the value calculated as the effective average annual VAT rate in total), made it possible to empirically characterise the dependent variable (explained) in further analyses. This is the

⁶Data available at: https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=icw_tax_10 (accessed: 27.08.2020).

average value of the monthly VAT tax rate per person in the household (per annum), characterised on the basis of the determined rates of spending for categories C1 to C12, for the entire research period⁷.

The source data confirm the validity of the belief that VAT tax revenues are dependent on the current growth potential in the national economy. A model explaining profitability in this respect, solely in reference to GDP and the size of the VAT gap (VAT defined as VTTL - VAT Total Tax Liability, according to the methodology adopted by Eurostat), provides an explanation of income volatility at the level of 98.8%. For:

$$\widehat{BR_VAT} = 14285.410 + 0.080Macr_GDP - 1244.568 Macr_GapVat$$

where BR_VAT is the state budget VAT revenue in million PLN, $Macr_GDP$ is the gross domestic product in million PLN at current prices, and $Macr_GapVAT$ represents the value of the VAT gap estimate in percentage points, in line with Eurostat methodology), $R^2 \approx 0.988$, and t-student statistics are respectively $t_{Macr_GDP} \approx 37.096$ and $t_{Macr_GapVat} \approx -5.873$, which confirms the statistical significance of the explanatory variables.

At the same time, this volatility is explained in 96.5%, a linear simple model in which only domestic demand is used as the explanatory variable: $\widehat{BR_VAT} = -17816.035 + 0.087Macr_DomDem$ (where $Macr_DomDem$ is an aggregate of domestic demand in current prices expressed in millions of PLN) gives $R^2 \approx 0.965$ with the $t_{Macr_DomDem} \approx 22.226$ statistics guaranteeing the significance of the variable.

Even if one looks at this issue from the perspective of the system of average monthly VAT household contribution per capita (estimated by applying effective system taxation, valued at 16%, imposed on the aggregate of household expenditure per capita), the level of explained volatility is still high, although it falls to about 92%: $\widehat{BR_VAT} = -51706.339 + 1234.775 Hh_AV_{VAT_PER}$ (where $Hh_AV_{VAT_PER}$ is an averaged VAT contribution in PLN⁸), finally gives $R^2 \approx 0.919$, with the confirmation of the significance of the explanatory variable $t_{Hh_AV_{VAT_PER}} \approx 14.281$. While decisions taken by members of households allocate Household's available

⁷It should be noted that this value is, as a consequence of the quality of the source data, a certain generalisation, e.g. due to the omission of the issue of taxing certain groups of goods with excise duty

⁸Based on the effective taxation (for VAT) of average per capita expenditure, rounded up to full percentage points (despite differences in component rates within groups in subsequent years and effective taxation within the groups themselves, effective taxation was 16% per year, which was taken as a reference for averaging the value of the realised contribution).

income accounting for VAT in a differentiated manner, as they are made with regard to expenditure categories characterised by different values of effective taxation.

Therefore, the part of VAT revenue that results from decisions generating expenditure on consumer goods and services in terms of categories: C1 to C12, was further analysed (the dependent variable already mentioned). The explanation for the so defined variability of the average monthly household VAT contribution per capita, is based on linear multiple regression models. In the next step, the individual share of categorised expenditure in total household expenditure (everything - per capita) was ordered by applying factor analysis of the specified categories, with the use of principal components method. (Cooper, 1983; Schilderincx, 1978; Lawley and Maxwell, 1962).

In the factor analysis model used to demonstrate the relationships occurring in the n -element set of X_j variables subject to observation ($[x_{ij}]_{m \times n}$ where $i = 1, 2, \dots, m$ and $j = 1, 2, \dots, n$, means i -th observation of j -th variable), each of the variables is described as a linear function of the unobservable and preferably uncorrelated common factors F_k (for $k = 1, 2, \dots, p$, where $p \leq n$) and a single unique (specific) factor U_j , uncorrelated with other factors in the model (Harman, 1967; Malarska, 2005). For this purpose, standardized real variables X_j , which are the base reference for further analysis and are denoted as Z_j (for $j = 1, 2, \dots, n$), are modelically replaced by a weighted sum of the components of the factor analysis model (common factors and unique factor), which are not variables themselves. Such a model takes the form:

$$\begin{cases} Z_1 = a_{11}F_1 + a_{12}F_2 + \dots + a_{1p}F_p + d_1U_1 \\ Z_2 = a_{21}F_1 + a_{22}F_2 + \dots + a_{2p}F_p + d_2U_2 \\ \dots \\ Z_n = a_{n1}F_1 + a_{n2}F_2 + \dots + a_{np}F_p + d_nU_n \end{cases} \quad (i)$$

which from a vector perspective, describing the equations of the above model, can be presented as:

$$\begin{bmatrix} Z_{1j} \\ Z_{2j} \\ \vdots \\ Z_{mj} \end{bmatrix} = a_{j1} \begin{bmatrix} f_{11} \\ f_{22} \\ \vdots \\ f_{m1} \end{bmatrix} + \dots + a_{jp} \begin{bmatrix} f_{1p} \\ f_{2p} \\ \vdots \\ f_{mp} \end{bmatrix} + d_j \begin{bmatrix} u_{1j} \\ u_{2j} \\ \vdots \\ u_{mj} \end{bmatrix} \quad (ii)$$

where: Z_j – is the j -th standardized primary variable; F_k – is the k -th common factor; U_j – is j -th unique (specific) factor; a_{jk} – indicates the loadings of the k -th common factor in the j -th variable; d_j – indicates the loading of the j -th specific factor; z_{ij} – is the value of the j -th standardized primary variable for the i -th observation; f_{ik} – is the value of the k -th common factor in the i -th observation; u_{ij} – is the value of the j -th specific factor for the i -th observation.

By including the factor loads (both common and specific factors) in the corresponding matrix, the whole model takes the form:

$$\mathbf{Z} = \mathbf{AF} + \mathbf{DU} \quad (\text{iii})$$

Both (ii) and (iii) indicate that, by model, each of the variables of the analysed set is presented as a linear combination of p common factors and one unique factor, dedicated exclusively to the underlying variable. The structure of the basic data (with multidimensional characteristics) is described by the variance–covariance matrix of Z_j variables, in which covariance is powered by common factors. A unique factor in this case is responsible for the variance of the variable with which it is associated. Processing focuses on the search for factor loadings to explain the dependence of variables Z_j (and therefore x_{ij}) on common factors F_k . This assumes a correlation of the primary variables, of inverse proportion to the influence of the unique factor. Only this correlation justifies the question about structural links between the examined variables, which can be verified by the classic Bartlett sphericity test (Bartlett, 1950), in which the test of the hypothesis of the statistical insignificance of correlation coefficients between variables is statistics:

$$\chi^2 = - \left(m - 1 - \frac{2n+5}{6} \right) \cdot \log|\mathbf{R}| : \chi_{n(n-1)/2}^2,$$

where m – is the number of observations, n – is the number of variables, and \mathbf{R} – is the matrix of Pearson's linear correlation coefficients between the analysed variables. Confirmation of the significance of associations between variables justifies searching for the values of the factor loadings, which will allow to express the information potential of the basic variables (related to each other, and thus generating the risk of statistical collinearity in the regression model) with appropriate factors, the number of which is generally smaller than the number of primary variables.

The reduction of regressors (independent, explanatory variables) in model $\mathbf{y} = \mathbf{X}\boldsymbol{\beta} + \boldsymbol{\epsilon}$, based on factor analysis assumes the orthogonalization of explanatory variables, allowing for the replacement of correlated explanatory variables with new variables (accurately factors) that accumulate the informational potential of primary variables, but without correlations. The aim is to orthogonally transform the n -elementary set of primary variables in such a way as to create a new set of variables (the so-called principal components), whose components can be presented as functions of primary, basic variables:

$$F_j = a_{j1}Z_1 + a_{j2}Z_2 + \dots + a_{jn}Z_n \quad (\text{dla } j = 1, 2, \dots, n) \quad (\text{iv})$$

which can be summarized in matrix notation as:

$$\mathbf{F} = \mathbf{A}^T \mathbf{Z} \quad (\text{v})$$

The obtained solution can be subjected to a rotation procedure, in which the shift of the factors-axis helps to define more precisely the value of the factor loadings. The inclusion of these new factors-variables (without or after rotation) allows to explain the variability of the variable explained in the regression model by unrelated (uncorrelated) factors, which represent the full explanatory potential of the primary variables. The results obtained thus make it possible to reduce the space of the underlying variables for further analysis, culminating in the presentation of a model explaining the variability of the average monthly household VAT contribution (per capita), this time based on designated factors (Scott Jr., 1966; Basilevsky, 1981; Lawley and Maxwell, 1973). In addition to the final conclusions, the subject differentiation of the studies in question was assessed based on a one-way analysis of variance (ANOVA), proving the heterogeneity of households defined by the source of income considered as the main one.

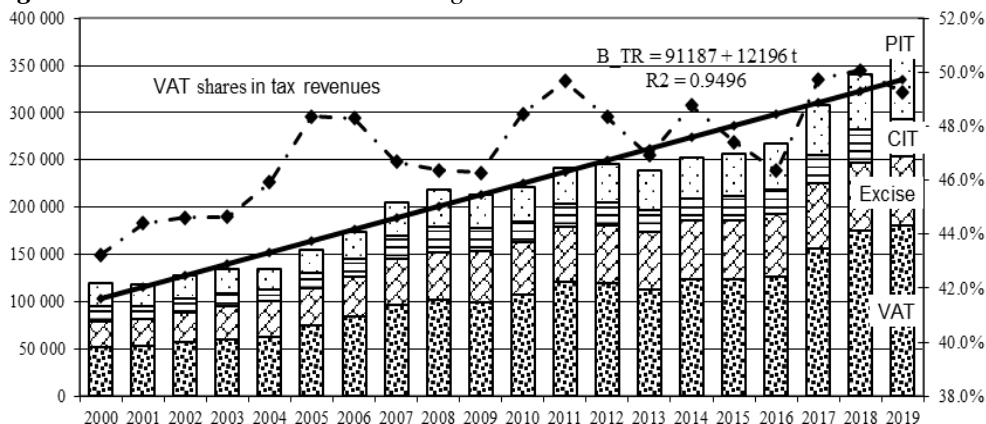
The proposed analytical pathway, despite its experimental nature and limited potential for expansion due to the aggregated nature of the data taken as a base, is interesting for at least three reasons: (1) it provides conclusions that can be interpreted although the source data are burdened by generality, (2) it indicates the conditions for possible precision by applying the original HBS panel data, (3) it allows recommendations for the modernization of the system of official statistics for further analysis. The methods used in it resulted from the need to indicate those directions of households' expenditure which have the greatest impact on changes in the amount of state budget revenue from VAT, subject to the importance of differentiating the purchase possibilities of particular types of households. Detailed analyses were conducted on the basis of own calculations, using analytical software: SPSS (Predictive Solutions), Statistica and MS Excel spreadsheet.

6. Detailed Arrangements and Findings

In the period 2000-2019, the tax revenues of state budget in Poland increased, and the dominant (in the range from 43.25% to 50.08%) was taken by VAT revenue (Figure 3), which usually grew nominally. The exception was 2013, when these revenues decreased by over PLN 6.5bn. Slight decreases were also recorded in 2009, 2012 and 2015. The importance of VAT in the state budget does not decrease, even if we add up the PIT and CIT revenues, transferred to all public budgets⁹.

⁹ *From the very beginning, the construction of both taxes assumed the division of revenues from their titles between the state and local government units, which up to and including 1998 were only communes, and since 1999 there are also counties ('powiat', i.e. the second-level unit of local government) and voivodeships (the highest-level administrative subdivision).*

Figure 3. VAT revenue in the state budget in Poland in 2000-2019



Note: * Regression line for budgetary tax revenues (B_TR)

Source: Own study based on EUROSTAT and Statistics Poland

(<https://ec.europa.eu/eurostat/data/>

[database](https://ec.europa.eu/eurostat/data/database); <https://ec.europa.eu>; <https://www.case-research.eu>; www.stat.gov.pl) –

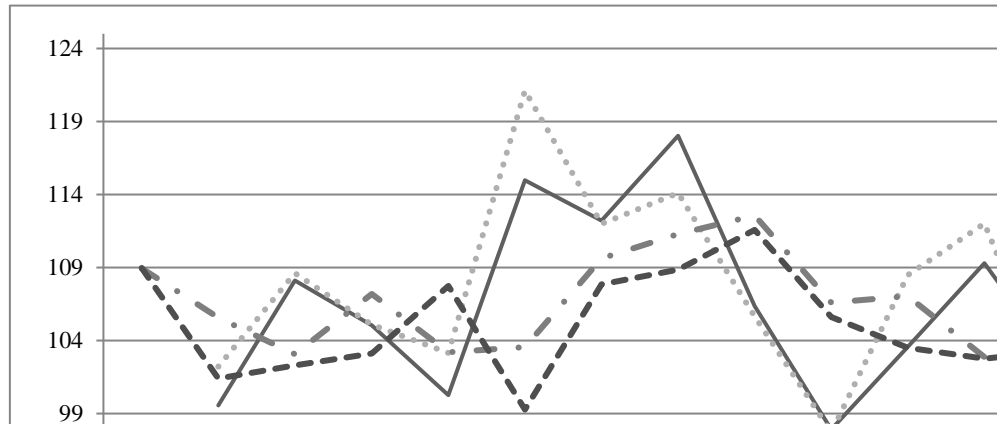
27.08.2020.

VAT revenue in the state budget arises from transactions by economic operators as it is paid in parts at each stage of the supply chain and its final burden is borne by purchasers of goods and services, including households. The data presented in Figure 4 shows that not all available financial resources in households were spent on consumption during almost the entire period under examination. Households' available income *per capita* grew faster than their *per capita* consumption expenditure. Nominally, in 2000 the difference was PLN 11.02, while in 2010 it reached the value of PLN 201.38, after which – from 2015 – it started to grow rapidly to reach PLN 567.41 in 2019 (over 30% of the average monthly disposable household income *per capita*). The inflow of funds to households from 2015 could be related, among others, to pro-social and pro-family policy instruments introduced by the state (school layette programme, 500+ programme, thirteenth pension). As can be seen, they did not translate into an increase in state budget revenues from VAT (which increased the pool of savings of these entities by limiting the scale of the VAT multiplier mechanism). The direction of changes in the state budget VAT revenue and household consumption expenditure was similar, but the dynamics were different.

At certain times, VAT revenue to the state budget grew faster than household consumption expenditure. The biggest increase in nominal VAT revenue was in 2005 (by 21.84%) and in 2016-2019 (by 42.9%), and household spending in this period increased by 10.9%. In other years (2000-2001, 2004, 2008-2009, 2013, 2015), the situation was the opposite, which may indicate the limited impact of household spending on the increase in VAT revenue and the actions taken by the state to increase it (tax audits, court proceedings and tools such as the *Standard Audit File for Tax, split payment* - improving the collection of this tax).

The question arises - could changes in VAT rates for selected goods and services have had an impact on the structure of household purchases and, consequently, on state budget revenue?

Figure 4. Dynamics of state budget revenues and household income and expenditure in Poland in the period 2000-2019 (in %)



Source: Own elaboration based on data from EUROSTAT and Statistics Poland (<https://ec.europa.eu/eurostat/data/database>; www.stat.gov.pl) – 27.08.2020.

The available public statistics in Poland show that expenditure on food and non-alcoholic beverages is decreasing in the structure of household spending. Back in 1999, their share in the total expenditure was 32.33%, and although their nominal value increased in subsequent years, it actually decreased in relative terms, as in 2015 they already accounted for 25.15% of total household expenditure, thus confirming the topicality of the Engel law. It should be emphasized that in the last four years covered by the study this trend has changed and their share in total household expenditure has increased by about 1 p.p. The reason for this can be seen in the faster rise in the prices of goods from the analysed group, as well as in the launching of social programmes by the state, aimed at children and pensioners.

The tools of these programmes have improved the financial situation of households with lower incomes, increasing their consumption of basic goods. It is also worth noting the changes that have taken place in the structure of purchases within the group (C1). Expenditure on the purchase of better quality, but also more expensive products: food, organic, functional and more processed products has increased. However, the precise determination of the reasons for the changes in this respect requires more in-depth research on poverty in Polish households and on the directions of their funds allocation. In the structure of household expenditure, the share of expenditure on the purchase of clothes and shoes also decreased by about 1.3 percentage points.

However, the significance of expenditure on the purchase of restaurant and hotel services increased (by 3.7 p.p.), communication services (by 1.7 p.p.), and in the remaining changes were directionally differentiated, but not higher than 1 p.p. The indicated regularities may indicate changes in the structure of household consumption expenditure favourable to budget revenues. This is because the share of expenditure on the purchase of goods and services covered by preferential rates was decreasing, and the share of expenditure on goods covered by the basic rate was increasing. These are, however, conclusions for the aggregated data, yet changes in the structure of purchases took place within individual groups of goods and services which could have been taxed at different rates, in accordance with the VAT rate matrix in force at the time. Doubts about this proposal could be allayed by a detailed analysis of household expenses, taking into account the diversity of the latter. Individual types of households, and among them specific households, are characterised by a different structure of consumer spending. This may be influenced by different criteria of their typology (e.g. basic source of income, age of members, place of residence, education level, consumption preferences, etc.). The precision of the obtained results would be a derivative from the scale of access to detailed data, taking into account these criteria.

What is important for the analyses and, consequently, the inference, is that the authors did not have panel data, but only processed data, and the methods used limit the conclusions and do not allow for generalisations. The type and scope of the processed data on which the authors worked has shown that there are significant shortcomings in public statistics with regard to the diversity of households and their purchasing decisions, which encouraged and led to the use of more advanced methods.

An explanation of the variability of the dependent variable (average for a given year monthly VAT contribution per capita, in the household) based on the shares (in the percentage point convention) of expenditure categorised C1 to C12, in the total expenditure - per capita in the household - is as follows (bold estimates of statistically significant variable parameters, at the level $\alpha = 0.05$):

According to the model, an increase in the share in the structure of total household expenses, expenses in category C12 (miscellaneous goods and services) by 1 p.p. results in the expectation of increasing the VAT tax rate (and thus also income from it) by an average of PLN 66.59, *ceteris paribus*. In the opinion of the authors, however, this category seems to be overinterpreted. Probably the respondents, having difficulty in assigning certain expenses to particular categories, include them (classify) in C12, which by its nature is only at the end of the classification. Other most important income stimulants are the categories: C9 (recreation and culture: 46.68 PLN) and C2 (alcoholic beverages and tobacco products: 43.85 PLN). It is likely that the latter results are distorted by the inclusion in the source expenditure of excise duties.

Table 1. Coefficients

| Model: | Unstandardized Coefficients | | Standardized Coefficients | T | Sig. |
|---|-----------------------------|---------------|---------------------------|---------------|--------------|
| | B | Std. Error | Beta | | |
| (Constant) | -2416.22 | 572.15 | | -4.223 | .0039 |
| SH_C1_in_TotEXP | 18.74 | 5.49 | 1.57 | 3.414 | .0112 |
| SH_C2_in_TotEXP | 43.85 | 15.36 | .30 | 2.855 | .0245 |
| SH_C3_in_TotEXP | 10.18 | 5.48 | .09 | 1.858 | .1055 |
| SH_C4_in_TotEXP | 28.66 | 6.87 | 1.01 | 4.170 | .0042 |
| SH_C5_in_TotEXP | 22.24 | 7.46 | .29 | 2.981 | .0205 |
| SH_C6_in_TotEXP | -1.01 | 6.36 | -.01 | -.158 | .8786 |
| SH_C7_in_TotEXP | 26.85 | 5.73 | .58 | 4.686 | .0022 |
| SH_C8_in_TotEXP | 30.67 | 8.13 | .54 | 3.771 | .0070 |
| SH_C9_in_TotEXP | 46.68 | 8.89 | 1.12 | 5.250 | .0012 |
| SH_C10_in_TotEXP | 10.74 | 5.40 | .08 | 1.988 | .0871 |
| SH_C11_in_TotEXP | 33.22 | 6.77 | 1.58 | 4.907 | .0017 |
| SH_C12_in_TotEXP | 66.59 | 9.19 | 1.12 | 7.246 | .0002 |
| Regression Summary for Dependent Variable: <i>Hh_AV_{VAT_PER}</i> R= 0.99931182 R ² = 0.99862411 Adjusted R ² = 0.99626544 F(12,7)=423.38 p<0.00000 Std.Error of estimate: 1.6036 | | | | | |

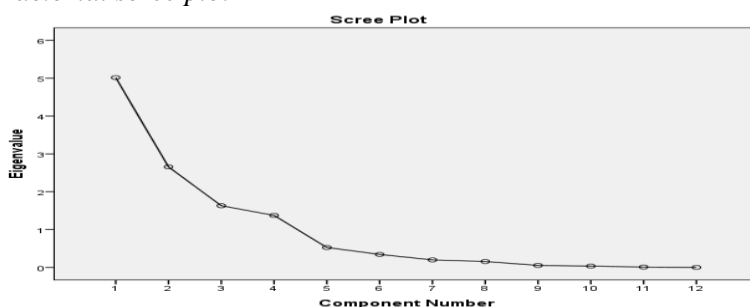
Source: *Own study.*

However, it is surprising in this model that the C6 variable is considered to be a destimulant of VAT profitability and also the statistical insignificance (at the selected level) of expenditure related to clothing and footwear (C3) and education (C10), in spite of explaining the model volatility at over 99.9%. A partial explanation of these paradoxical conclusions should be considered to be the strength and the exclusionary directions of correlations of some explanatory variables, leading to collinearity. If one eliminates the indicated destimulant from the model, this will restore the statistical significance of the remaining explanatory variables, without any loss in fitting the model to the data, which will allow an economically reasonable interpretation of the conclusions received.

However, such action, with regard to the purpose of the tests, has no other justification than technical. A simplified (due to the source basis) model analysis generates problems in several dimensions, two of which seem to be most important. This is firstly, the burden related to interactions within the set of explanatory variables and secondly, the excessive simplification caused by the fact that the source data's aggregates abstract from the diversity within the surveyed households (e.g. in terms of the number of children or the nature of economic activity of members, which is also significant in relation to expenditure in category C6). From the point of view of the decision-making processes in households, however, it is desirable to include all the spending categories in the analysis, also in order to separate connections between them. Thus, rather than arbitrarily removing the explanatory variable associated with the share of C6 expenditure, it would be more appropriate to carry out a factor analysis of all the variables in order to identify group relationships and explore the structural links between them.

The empirical statistics of Bartlett's test of sphericity are 290.345, which justifies the rejection of the zero hypothesis of non-correlation of the variables tested and allowing analysis of their interrelationships. This result, however, can be questioned due to the sample size, therefore, as a complement, a measure of Kaiser-Meyer-Olkin sampling adequacy (KMO) and an in-depth analysis of the scree plot were applied. In the case the authors are interested in, the KMO measure (0.282) is not a sufficient criterion to verify the sample's appropriateness, as it suggests that there are no links between the shares of the categorised expenditure in total expenditure. However, if this measure is determined for the expenditure itself (where Bartlett's empirical statistics for the sphericity test are 589.841), the KMO is already 0.801. Therefore, it is proposed that an attempt to extract links within the shares of categorised expenditure, in total expenditure, be considered justified after all.

Figure 5. Factorial scree plot



Source: Own analysis, SPSS (Predictive Solutions).

In addition, the factorial scree plot in Figure 5 justifies the need to group the twelve variables analysed in at least four factors, as confirmed by the analysis of the variance explained by the further factors (method of extracting: principal components method):

Table 2. Total Variance Explained

| Component | Initial Eigenvalues | | | Extraction Sums of Squared Loadings | | |
|-----------|---------------------|---------------|--------------|-------------------------------------|---------------|--------------|
| | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % |
| 1 | 5.017 | 41.809 | 41.809 | 5.017 | 41.809 | 41.809 |
| 2 | 2.656 | 22.137 | 63.945 | 2.656 | 22.137 | 63.945 |
| 3 | 1.630 | 13.585 | 77.530 | 1.630 | 13.585 | 77.530 |
| 4 | 1.375 | 11.457 | 88.988 | 1.375 | 11.457 | 88.988 |
| 5 | .526 | 4.385 | 93.372 | .526 | 4.385 | 93.372 |
| 6 | .343 | 2.859 | 96.231 | | | |
| 7 | .199 | 1.660 | 97.891 | | | |
| 8 | .156 | 1.298 | 99.189 | | | |
| 9 | .053 | .444 | 99.633 | | | |
| 10 | .033 | .279 | 99.911 | | | |
| 11 | .010 | .085 | 99.997 | | | |
| 12 | .000 | .003 | 100.000 | | | |

Source: Own analysis, SPSS (Predictive Solutions).

When interpreting a scree plot, the acceptable solution for reducing the initial set of variables is to adopt target homogeneous groups of three to five variables. In turn, the Kaiser normalization criterion suggests a solution based on four factors. The detailed characteristics of the subsequent variants confirm such a proposal, where a factor-based solution based on four components allows to explain 88.98% of the variance. Based on the principal components method, without rotation, its detailed results are as follows:

Table 3. Component Matrix

Factor Loadings (Unrotated), Extraction: Principal components

| Marked loadings are > 0.700000 | Component | | | |
|--------------------------------|---------------|---------------|---------------|--------------|
| | 1 | 2 | 3 | 4 |
| SH_C1_in_TotEXP | -0.909 | 0.008 | 0.347 | -0.083 |
| SH_C2_in_TotEXP | -0.978 | -0.033 | 0.001 | -0.056 |
| SH_C3_in_TotEXP | -0.075 | 0.043 | 0.265 | 0.920 |
| SH_C4_in_TotEXP | 0.102 | -0.844 | -0.396 | -0.157 |
| SH_C5_in_TotEXP | -0.060 | 0.888 | 0.206 | 0.224 |
| SH_C6_in_TotEXP | 0.901 | -0.214 | 0.023 | 0.005 |
| SH_C7_in_TotEXP | 0.085 | 0.747 | -0.509 | -0.142 |
| SH_C8_in_TotEXP | 0.349 | -0.650 | 0.291 | 0.341 |
| SH_C9_in_TotEXP | 0.001 | 0.081 | -0.855 | 0.426 |
| SH_C10_in_TotEXP | -0.835 | -0.055 | 0.170 | -0.229 |
| SH_C11_in_TotEXP | 0.895 | 0.243 | 0.202 | -0.228 |
| SH_C12_in_TotEXP | 0.881 | 0.239 | 0.308 | -0.148 |
| Expl.Var | 5.017 | 2.656 | 1.630 | 1.375 |
| Prp.Totl | 0.418086 | 0.221368 | 0.135847 | 0.114574 |

Source: Own analysis, SPSS (Predictive Solutions).

The first factor groups the expenditure that can be considered as existentially significant even if in part related to addictions (food, alcoholic beverages and tobacco, health, education, restaurants and hotels and others). The over-representation of expenditure under category C12 has already been mentioned. The significance of expenditure on restaurant and hotel services is most likely linked to a noticeable change in the lifestyle of household members. The presence of alcohol and tobacco expenditure in this group is partly a confirmation of the constraints on decision-making related to addiction, which allow to include these expenditures as basic needs.

The second factor is the necessary complementary expenditure, related to housing (use of the dwelling, its furnishings, energy carriers) and moving (mobility), e.g. for work (transport). The shares of expenditure in the category of connectivity, were considered insignificant in this solution to explain the variance, but their strongest representation (in solutions up to and including twelve factors) is in the second factor, where the loading (regardless of the direction) is slightly smaller than the limit (0.700). The single-variable components, i.e. the third one (recreation and

culture) and the fourth one (clothing and footwear), complete the presented explanation.¹⁰

In the next step, thanks to the designation of the vectors of factor values, a regression analysis was performed, without losing the information potential of the primary variables, basing the explanation of the variability of household VAT contribution (*per capita*) on the uncorrelated factor variables:

Table 4. Coefficients

| Model: | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---------------------|-----------------------------|-------------|---------------------------|---------------|--------------|
| | B | Std. Error | Beta | | |
| (Constant) | 106.57 | 1.55 | | 68.566 | .0000 |
| REGR factor score 1 | 24.07 | 1.59 | .92 | 15.097 | .0000 |
| REGR factor score 2 | 5.99 | 1.59 | .23 | 3.757 | .0019 |
| REGR factor score 3 | -5.04 | 1.59 | -.19 | -3.158 | .0065 |
| REGR factor score 4 | -3.11 | 1.59 | -.12 | -1.950 | .0701 |

Regression Summary for Dependent Variable: *Hh_AV_{VAT_PER}*
R= 0.97190946 R²= 0.94460799 Adjusted R²= 0.92983679
F(4,15)=63.949 p<0.00000 Std. Error of estimate: 6.9509

Source: *Own analysis, SPSS (Predictive Solutions).*

The model confirms the largest share in the explanation of the profitability of the VAT contribution, namely transactional decisions, which are significantly explained by the first factor. Changes in tax rates in the group of transactions representing priority categories for this factor are most significant from the point of view of both state budget revenues (fiscal function of the tax) and households (non-fiscal functions of the tax). An optimal matrix of such rates, determined with respect to EU directives, is a matter that is still unresolved - all the more so because the tax system outside of fiscal targets is often burdened with other guidelines, e.g. those related to social policy (like ensuring the progressiveness of the tax system). In the model obtained, it is also surprising that the fourth factor, representing the largest share of expenditure on clothing and footwear, is not significant. This shortcoming is probably a consequence of simplifications in the source data, showing the situation of the households, regardless of their actual differentiation. Interestingly, excluding this factor from the explanatory variables does not improve the model's results.

With regard to the matter of explication, in order to allow a more precise interpretation of the final conclusions, in relation to the actual intra-system

¹⁰The analysis is slightly different in the case, providing an orthogonal solution, of the popular Varimax rotation (in the version with Kaiser standardisation, the method of separating factors, which are still the principal components), in which a group of insignificant variables expands the share of expenditure in the category of transport, excluding it from the necessary supplementary expenditure (the rotation does not improve the degree of explanation of the total variance). In further analysis, the results based on factor analysis without rotation are considered as underlying.

relationships, it would be important to repeat the proposed analytical pathway applying to the panel data of the source research, taking into account the diversity of the information environment. To illustrate this, a one-way analysis of the variance (ANOVA) of simplified VAT burden on household members can be used, taking into account the types of households present in the HBS, i.e. households of: workers (H1), farmers (H2), self-employed (H3), pensioners (H4). Due to the available data, the analysis refers to the period 2003-2019, for which VAT contribution was averaged to 16% of the total expenditure in a given category per household. The statistics of the normality test will be more clear for survey (panel) data, but even for series with processed (aggregated) data one can consider the normality of their distribution as confirmed at the level $\alpha = 0.05$:

Table 5. Tests of Normality

| | Shapiro-Wilk | | |
|---------------------------|--------------|----|-------|
| | Statistic | df | Sig. |
| Households: workers | 0.912 | 17 | 0.108 |
| Households: farmers | 0.969 | 17 | 0.797 |
| Households: self-employed | 0.901 | 17 | 0.071 |
| Households: pensioners | 0.922 | 17 | 0.162 |

Source: Own analysis, SPSS (Predictive Solutions).

Based on the Levene test (the statistic is 1.017, on the base of mean), it should be stated that the probability of assessing the homogeneity of variance in the analysed groups is 0.391, so there are no grounds for rejecting the zero hypothesis about the homogeneity of variance in the analysed groups. Thus, it is not necessary to perform the Welch or Brown-Forsythe tests. Finally, the analysis of variance for the purposes of the conducted research was based on the F-Snedecor test:

Table 6. ANOVA

Averaged monthly VAT contribution

| | Sum of Squares | Df | Mean Square | F | Sig. |
|----------------|----------------|----|-------------|--------|--------|
| Between Groups | 36476.848 | 3 | 12158.949 | 17.256 | 0.0001 |
| Within Groups | 45095.863 | 64 | 704.623 | | |
| Total | 81572.711 | 67 | | | |

Source: Own analysis, SPSS (Predictive Solutions).

The significance of the test for the area under study orders means that the zero hypothesis should be rejected in favour of the alternative hypothesis, which leads to the conclusion that the average of VAT contribution burden on the expenditure in the surveyed households is not equal. This, in turn, gives rise to an analysis of multiple comparisons, summarised (limited to Scheffé test) by the results (Table 7). The results confirm, that the average monthly burden of VAT contribution differs significantly between households of workers, farmers and the self-employed. The situation of farmers' households stands out the most with regard to the average

burden of expenditure (the difference is significant in relation to all other types of households). The greatest similarity in the burden of expenditure is shown by the employee and pensioner households, which is surprising but confirmed by the Student-Newman-Keuls test (Table 8):

Table 7. Multiple Comparisons

Dependent Variable: averaged monthly VAT contribution

| | (I) Type of household | (J) Type of household | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval | |
|------------------|-----------------------|-----------------------|-----------------------|------------|------|-------------------------|-------------|
| | | | | | | Lower Bound | Upper Bound |
| Test: Scheffe | H1 | H2 | 33.03471* | 9.10477 | .007 | 6.8919 | 59.1776 |
| | | H3 | -31.19294* | 9.10477 | .013 | -57.3358 | -5.0501 |
| | | H4 | -9.87647 | 9.10477 | .759 | -36.0193 | 16.2664 |
| | H2 | H1 | -33.03471* | 9.10477 | .007 | -59.1776 | -6.8919 |
| | | H3 | -64.22765* | 9.10477 | .000 | -90.3705 | -38.0848 |
| | | H4 | -42.91118* | 9.10477 | .000 | -69.0540 | -16.7683 |
| | H3 | H1 | 31.19294* | 9.10477 | .013 | 5.0501 | 57.3358 |
| | | H2 | 64.22765* | 9.10477 | .000 | 38.0848 | 90.3705 |
| | | H4 | 21.31647 | 9.10477 | .151 | -4.8264 | 47.4593 |
| | H4 | H1 | 9.87647 | 9.10477 | .759 | -16.2664 | 36.0193 |
| | | H2 | 42.91118* | 9.10477 | .000 | 16.7683 | 69.0540 |
| | | H3 | -21.31647 | 9.10477 | .151 | -47.4593 | 4.8264 |

* The mean difference is significant at the 0.05 level.

Source: Own analysis, SPSS (Predictive Solutions).

Table 8. Homogeneous subset: averaged monthly VAT contribution

| | Type of household | N | Subset for alpha = 0.05 | | |
|--|-------------------|----|-------------------------|----------|----------|
| | | | 1 | 2 | 3 |
| Test: Student-Newman-Keuls ^a | H2 | 17 | 101.2471 | | |
| | H1 | 17 | | 134.2818 | |
| | H4 | 17 | | 144.1582 | |
| | H3 | 17 | | | 165.4747 |
| | Sig. | | 1.000 | .282 | 1.000 |

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 17.000.

Source: Own analysis, SPSS (Predictive Solutions).

The conclusions of the analysis indicate that there is a significant relation between: (1) purchase (transactional) activity of households and VAT revenue for the state budget; (2) directions of households' expenditure (type of goods and services purchased and VAT rate assigned to them) and the amount of revenue from the tax in question; (3) type of household and the amount of VAT generated from the purchases made by its members.

7. Conclusions and Recommendations

Based on the conducted analyses and research it can be stated that:

- 1) household consumption, interpreted as incurring expenses to purchase goods and services, which takes place in the officially documented business activity, is the main source of state budget revenue related to VAT;
- 2) the amount of VAT revenue created by households' consumption depends on the financial resources at their disposal, the way they spend them and on the structure of that expenditure;
- 3) households are highly diverse internally, and the size and the structure of their purchases varies in time and is determined by numerous factors;
- 4) the diversity of VAT rates applied to individual goods and services purchased by households has a significant influence on the level of state budget revenues based on VAT;
- 5) the financial transfers made to households, which reflect a variety of social policy tools implemented by the state, such as the pro-family policy, result in an increase of VAT revenue for the state; the effectiveness of these transfers – both for the realisation of state policy and the increase of its tax revenues – can be stimulated through the use of an appropriate matrix of VAT rates;
- 6) the limited availability or the lack of detailed statistical data regarding the burden of VAT in household expenditure, as well as the structure of the state budget revenue resulting from that tax in the overall cross-section of taxation rates, reduces the analytical potential of this study and the possible conclusions.

Recommendations:

- 1) it is recommended to conduct further research on the variability of the VAT burden on the expenditure of households, taking into consideration its diversity;
- 2) it is necessary to make a more detailed study of the structure of households' expenditure on consumption, complemented by in-depth analyses of purchasing decisions made by household members, also in terms of an interdisciplinary approach;
- 3) it is indispensable to carry out research on the directions of the distribution of financial transfers as part of the implemented state policy, and on the structure of their expenditure by households;
- 4) in order to improve the effectiveness of the non-fiscal function of VAT, the authors suggest including in the official statistics the VAT burden on household expenditure in the cross-section of the purchasing goals.

References:

- Agha A., Haughton, J. 1996. Designing VAT systems: Some efficiency considerations. *Review of Economics and Statistics* no. 78(2).
- Alm, J., El-Ganainy, A. 2013. Value-added taxation and consumption. *International Tax and Public Finance*, 20(1), 105-128.
- Arsić, M., Altiparmakov, N. 2013. Equity aspects of VAT in emerging European countries: a case study of Serbia. *Economic Systems*, 37(2), 171-186.

- Ateca-Amestoy, V., Gardeazabal, J., Ugidos, A. 2020. On the response of household expenditure on cinema and the performing arts to changes in indirect taxation: a natural experiment in Spain. *Journal of Cultural Economics*, 44, 213-253.
- Baltagi, B. 2008. *Econometric analysis of panel data*. John Wiley & Sons Ltd.
- Barbone, L., Bonch-Osmolovskiy, M., Poniatowski, G. 2014. 2012 Update Report to the Study to quantify and analyse the VAT Gap in the EU-27 Member States. CASE Network Reports, 120.
- Barrell, R., Martin, W. 2009. The Economics of a Reduction in VAT. *Fiscal Studies*, 30(1), 17-30.
- Bartlett, M.S. 1950. Tests of significance in factor analysis. *British Journal of Psychology*, 3, 77-85.
- Basilevsky, A. 1981. Factor Analysis Regression. *The Canadian Journal of Statistics*, 9(1), 109-117.
- Bedau, K.D. 1996. Increase in VAT would affect households in different income categories roughly equally. *Economic Bulletin*, 33, 27-32.
- Bird, R., Gendron, P.P. 2007. *The VAT in Developing and Transitional Countries*. Cambridge, Cambridge University Press.
- Borowiecki, K.J., Navarrete, T. 2018. Fiscal and economic aspects of book consumption in the European Union. *Journal of Cultural Economics*, 42, 309-339.
- Bukowski, S.I., Kaczmarczyk, J.E. 2007. Funkcje podatków w gospodarce we współczesnych nurtach ekonomii, w: S.I. Bukowski, M. Pypeć (red.), *Podatki w Unii Europejskiej. Harmonizacja czy konkurencja podatkowa*, Zakład Poligraficzny Politechniki Radomskiej, Radom.
- Bye, B., Strøm, B., Åvitsland, T. 2011. Welfare effects of VAT reforms: a general equilibrium analysis. Discussion Papers 343, Statistics Norway.
- CASE. 2019. Study and reports on the VAT gap in the EU-28 member states: 2019 final report, Warszawa, https://ec.europa.eu/taxation_customs/sites/taxation/files/vat-gap-full-report-2019_en.pdf.
- Cashin, D. 2017. The Household Expenditure Response to a Consumption Tax Rate Increase. Finance and Economics Discussion Series, No 035. Washington, Board of Governors of the Federal Reserve System.
- Chang, W. 2006. Relative Wealth, Consumption Taxation, and Economic Growth. *Journal of Economics*, 88(2), 103-129.
- Cnossen, S. 1998. VATs in CEE Countries: A Survey and Analysis. *De Economist*, 146, 227-255.
- Cooper, J.C.B. 1983. Factor Analysis: An Overview. *The American Statistician*, 37(2), 141-147.
- Cupák, A., Toth, P. 2017. Measuring the Efficiency of VAT reforms: Evidence from Slovakia. Bratislava, National Bank of Slovakia.
- Drăcea, M., Buziernescu, R., Florea, N.M. 2013. Harmonization of VAT in the European Union. *Achievements and Perspectives Finance. Challenges of the Future*, 15, 60-65.
- Engen, E.M., Skinner, J. 1999. Taxation and Economic Growth. In: *Tax Policy in the Real World*, J. Slemrod (Ed.). New York, Cambridge University Press, 305-330.
- Ferri, J., Molto, M.L., Uriel, E. 2009. Time Use and Food Taxation in Spain. *FinanzArchiv. Public Finance Analysis*, 65(3), 313-334.
- Fiscalis, Tax Gap Project Group. 2016. The Concept of Tax Gaps. Report on VAT Gap Estimations. FPG/041, Brussels. https://ec.europa.eu/taxation_customs/sites/taxation/files/vat-gap-full-report-2019_en.pdf.

- Fisher, W.H., Hof, F.X. 2000. Relative Consumption, Economic Growth, and Taxation. *Journal of Economics*, 72(3), 241-260.
- Frenkel, J.A., Razin, A., Symansky, S.A. 1991. International VAT harmonization: economic effects. NBER Working Papers Series No. 3656. Cambridge, National Bureau of Economic Research.
- Genser, B. 2003. Coordinating VATs Between EU Member States. *International Tax and Public Finance*, 10, 735-752.
- Harju, J., Kosonen, T., Ropponen, O. 2014. Do honest hairdressers get a haircut? On tax rate and tax evasion. *Proceedings. Annual Conference on Taxation and Minutes of the Annual Meeting of the National Tax Association*, 107, 1-32.
- Harju, J., Matikka, T., Rauhanen, T. 2016. The effects of size-based regulation on small firms. *Proceedings. Annual Conference on Taxation and Minutes of the Annual Meeting of the National Tax Association*, 109, 1-42.
- Harman, H.H. 1967. *Modern Factor Analysis*. Chicago-London, The University of Chicago Press.
- Hondroyannis, G., Papaioikonomou, D. 2017. The effect of card payments on VAT revenue: New evidence from Greece, *Economics Letters*, Volume 157, Elsevier.
- Jenkins, G.P., Jenkins, H., Kuo, Ch.Y. 2006. Is The Value Added Tax Naturally Progressive? Working Paper 1059, Economics Department, Queen's University.
- Keen, M. 2007. VAT attacks! *International Tax and Public Finance*, 14, 365-381.
- Keen, M., Lockwood, B. 2007. *The Value Added Tax: Its Causes and Consequences*. EUI, Working Papers ECO 09, European University Institute.
- Keen, M., Lockwood, B. 2010. *The Value Added Tax: Its Causes and Consequences*. *Journal of Development Economics*, Volume 92, Issue 2, Elsevier B.V.
- Kostecki, A. 2004. Przesłanki i metody harmonizacji prawa podatkowego z unijnym prawem podatkowym, w: A. Kostecki (red.), *Prawo finansowe i nauka prawa finansowego na przełomie wieków*, Katedra Prawa Finansowego Uniwersytetu Jagiellońskiego, Zakamycze, Kraków.
- Kotlińska, J. 2018. Podatek od towarów i usług (VAT) i jego ściągalność w Polsce. *Ekonomista*, nr 5.
- Kudła, J. 2006. Analiza wybranych czynników konwergencji stóp podatkowych w krajach UE, w: M. Kruszka (red.), *Gospodarka w warunkach integracji europejskiej*, Group Daniel Krzanowski, Szczecin.
- Lawley, D.N., Maxwell, A.E. 1962. Factor Analysis as a Statistical Method. *Journal of the Royal Statistical Society. Series D (The Statistician)*, 12(3), 209-229.
- Lawley, D.N., Maxwell, A.E. 1973. Regression and Factor Analysis. *Biometrika*, 60(2), 331-338.
- Lyssiotou, P., Savva, E. 2020. Who pays taxes on basic foodstuffs? Evidence from broadening the VAT base. <https://doi.org/10.1007/s10797-020-09605-6>.
- Malarska, A. 2005. *Statystyczna analiza danych wspomagana programem SPSS*. Kraków, SPSS Polska, 207-230.
- McCreevy, Ch. 2005. Tax harmonization – no thanks. *European Business Initiative on Taxation*, Bruksela.
- Myck, M., Kundera, M., Najsztab, M., Oczkowska, M. 2015. VAT w wydatkach gospodarstw domowych: konsekwencje zmian systemu i zróżnicowanie obciążeń względem struktury demograficznej. *Raport Przedwyborczy CenEA*.
- Myles, G. 2000. Taxation and economic growth. *Fiscal Studies*, 21 (1), 141-168.
- Nerudova, D., Dobranschi, M. 2019. Alternative method to measure the VAT gap in the EU: Stochastic tax frontier model approach. *PLoS ONE* 14(1).

- Olexová, C., Hušťák, M. 2018. Harmonization of Value Added Tax Applicable in the Slovak Republic in European Union Legislation. *International Multidisciplinary Scientific Conference on Social Sciences & Arts SGEM*, 5, 561-568.
- Oręziak, L. 2009. *Finanse Unii Europejskiej*, wyd. 2. PWN, Warszawa, 260-274.
- Owsiak, S. 2017. *Finanse publiczne. Współczesne ujęcie*. PWN, Warszawa, 269.
- Pomorska, A., Szolno-Koguc, J., Wójtowicz, K. 2003. *Proces dostosowywania polskich podatków pośrednich do standardów Unii Europejskiej*. Wydawnictwo UMCS, Lublin.
- Rauscher, M. 1997. Conspicuous Consumption, Economic Growth, and Taxation. *Journal of Economics*, 66(1), 35-42.
- Reckon, LLP. 2009. Study to quantify and analyse the VAT gap in the EU-25 Member States. London, DG Taxation and Customs Union
https://ec.europa.eu/taxation_customs/sites/taxation/files/docs/body/reckon_report_sep2009.pdf.
- Richter, W. 2000. An Efficiency Analysis of Consumption and Production Taxation with an Application to Value-Added Taxation. *International Tax and Public Finance*, 7, 23-41.
- Sarnowski, J., Selera, P. 2019a. Reducing the VAT Gap - Polish Experience and Legislative Measures Introduced in Years 2016-2018. *International VAT Monitor*, 30(3), 121-127.
- Sarnowski, J., Selera, P. 2019b. Reducing the VAT gap: lessons from Poland. Causes – Remedies – Outlook. Warsaw, Polish Economic Institute.
- Schilderlinck, J.H.F. 1978. *Regression and factor analysis applied in econometrics*. Leiden, Martinus Nijhoff Social Sciences Division.
- Scott, J.T. Jr. 1966. Factor Analysis and Regression. *Econometrica*, 34(3), 552-562.
- Spirakis, G., Sarantidis, A. 2017. The Impact of Tax Policy on the Economic Growth of Greece. In: *Taxation in Crisis. Tax Policy and the Quest for Economic Growth*, D. Thomakos, D., K. Nikolopoulos, K. (eds). Palgrave Macmillan Studies in Banking and Financial Institutions. Cham, Palgrave Macmillan, 411-437.
- Thalassinos, I.E., Stamatopoulos, D.T., Thalassinos, E.P. 2015. The European Sovereign Debt Crisis and the Role of Credit Swaps. Chapter book in *The WSPC Handbook of Futures Markets* (eds) W. T. Ziemba and A.G. Malliaris, in memory of Late Milton Miller (Nobel 1990) *World Scientific Handbook in Financial Economic Series Vol. 5*, Chapter 20, 605-639. DOI: 10.1142/9789814566926_0020.
- Trandafir, A. 2016. Methods of measurement and benchmarking of VAT gap in the European Union. *Economics, Management, and Financial Markets*, 11(1), 361-369.
- Urîtescu, A.M. 2018. What Is the Impact of Value Added Tax on GDP in Romania and Bulgaria? In: R. Orăștean, C. Ogrean, S. Mărginean (eds), *Innovative Business Development - A Global Perspective*. Springer Proceedings in Business and Economics. Cham, Springer Nature Switzerland.
- van Brederode, R.F., Krever, R (eds.). 2017. *VAT and Financial Services. Comparative Law and Economic Perspectives*. Singapore, Springer Nature Singapore Pte Ltd.
- Ustawa z dnia 10 września 2015 roku o zmianie ustawy – Ordynacja podatkowa oraz niektórych innych ustaw, 2015, (DzU 2015 poz. 1649).
- Ustawa z dnia 1 grudnia 2016 roku o zmianie ustawy o podatku od towarów i usług oraz niektórych innych ustaw, 2016, (DzU 2016 poz. 2024).
- Ustawa z dnia 15 grudnia 2017 roku o zmianie ustawy o podatku od towarów i usług oraz niektórych innych ustaw, 2017, (DzU 2018 poz. 62).
- Methodological report. Household budget survey. 2018, Statistics Poland, Warsaw.
- Zhang, J., Davies, J., Zeng, J., McDonald, S. 2007. Optimal taxation in a growth model with public consumption and home production. *Journal of Public Economics*, 92(3-4), 885-896.