Doctoral School of Economics and Business Informatics

THESIS SUMMARY
to the Ph.D. dissertation by

Ildikó Ritzlné Kazimir

The development of VAT fraud between 2006 and 2016 in Hungary

Supervisor:

DR. András Sugár
head of department, associate professor

Budapest, 2021

Department of Statistics

THESIS SUMMARY
to the Ph.D. dissertation by

Ritzlné Kazimir Ildikó

The development of VAT fraud between 2006 and 2016 in Hungary

Supervisor:

DR. András Sugár
head of department, associate professor

Content

1. Research background and account for the topic

The full consideration of economic performance and activities is an obvious goal of statistics, a condition to produce macroeconomic indicators. There are three main reasons for this. The most important is to ensure the matches of the balance sheets. Producing data of the appropriate quality for economic policy makers, researchers and other users cannot be achieved without full coverage of production. Finally, due to the international comparability of the data, it is necessary to consider the same range of activities.

The legal and professional regulatory framework for the compilation of national accounts provides a detailed description and accounts for the considering activities. Some of these are international recommendations, such as the SNA 2008, but many regulations are part of European Union legislation, such as the ESA 2010. According to key recommendations and legislation, the non-observed economic performance due to the tax fraud, as well as taxes paid but not transferred to the budget have to be recorded in the national accounts.

Tax fraud is a significant problem. In Hungary, VAT is the most significant tax revenue, in 2016 it accounted for 40% of all tax revenues. This year, the VAT gap reached 13.3% of VTTL (VAT Total Tax Liability) according to the estimates of the European Commission. (Európai Bizottság, 2018) The tax fraud is related to non-observed economic performance, as well. The non-observed gross value added due to tax fraud was 9.55% and 8.8% of GDP in 2002 and in 2005. (Murai & Ritzlné Kazimir, 2011)

The VAT gap is not only decisive due to the magnitude of VAT revenue, but the thus concealed economic performance significantly distorts macro-statistical

indicators. Such distortions include – to highlight some typical examples – sales without invoices, sham subcontracting, and domestically sold paper-exported products.

1.1. The aims of the research

The main aim of the research is to build a consistent and coherent model that is suitable for the detailed estimation of VAT fraud. The model is applied for estimation of VAT fraud in Hungary between 2006 and 2016. I tested and validated the estimation results calculated using the model in the light of domestic and international research results.

As VAT fraud varies in international comparison and its domestic practice is quite diverse, the research placed great emphasis on building the theoretical framework of complient behaviour and examining the Hungarian economic history, as the proper theoretical framework and the knowledge on background, characteristics and history are an essential condition for model building.

The expected results of the research are the following:

> EO1: SUMMARY OF TAX FRAUD THEORY, AND ITS HISTORY IN HUNGARY, PRESENTATION ON TAX FRAUD HETEROGENEITY.

> EO2: EVALUATION OF AVAILABLE ESTIMATION METHODS FOR QUANTIFICATION OF VAT FRAUD

> EO3: COMPILATION OF DATABASES CONTAINING MICRO-DATA FOR THE YEARS 2006-2016

EO4: ESTABLISHMENT OF APPROPRIATE ESTIMATION MODEL, TAKING INTO ACCOUNT THE CHARACTERISTICS OF VAT FRAUD

EO5: IMPLEMENTATION OF THE ESTIMATE FOR 2006-2016, EVALUATION AND VALIDATION OF RESULTS

EO6: DETECTION OF THE ECONOMIC-GROWTH AND ECONOMIC-CRISIS INFLICTED IMPACT ON THE DEVELOPMENT OF VAT FRAUD IN HUNGARY

To achieve this goal, the following sub-goals are included, which can be achieved by utilizing the results expected from the research:

RO1: WHAT ARE THE MOTIVATIONS AND FACTORS BEHIND THE NONCOMPLIENT AND FRAUDULENT BEHAVIOUR?

RO2: WHAT HISTORICAL PRECEDENTS OF NON-OBSERVED ECONOMY IN HUNGARY EXIST AND HOW MUCH DOES IT EXPLANATE THE RELATIVELY HIGH LEVEL OF VAT FRAUD?

RO3: HOW CAN THE METHODS BE USED IN THE INTERNATIONAL LITERATURE AND RECOMMENDED BY INTERNATIONAL ORGANIZATIONS TO ESTIMATE VAT FRAUD?

RO4: WHICH FACTORS HAVE INFLUENCED THE DEVELOPMENT OF VAT FRAUD IN HUNGARY IN THE LAST DECADE?

1.2. Research questions

The research seeks answers to the following questions:

> RQ1: HOW CAN VAT FRAUD BE ESTIMATED AT THE LEVEL OF INDIVIDUAL ORGANIZATIONS?
>
> RQ2: HOW DID THE LEVEL OF VAT FRAUD DEVELOP IN HUNGARY BETWEEN 2006-2016?
>
> RQ3: HOW CAN THE RESULT BE VALIDATED?
>
> RQ4: IT IS POSSIBLE TO DETECT THE ECONOMIC-GROWTH AND THE ECONOMIC-CRISIS INFLICTED IMPACT ON THE DEVELOPMENT OF VAT FRAUD IN HUNGARY DURING THE PERIOD UNDER REVIEW?

2. The methods used

The chapter presents the state of science, research methods and the data used.

2.1 The state of the literature and the role of the topic in the development of official statistics

The study of VAT fraud in the literature should be extended to the following areas from the point of view of the research:

- economic models
- statistical models
- appearance in national accounts.

An overview of economic history is also related to the exploration of economic models.

In economic models, the basic model of circumvention behaviour was Becker's microeconomic model. (Becker, 1974) The model he defined was extended to income tax fraud by Allingham and Sandmo. (Allingham & Sandmo, 1972). The individualistic basic assumption is not generally fulfilled in reality due to altruistic behaviour, cognitive bias, and seemingly irrational behaviour due to personality traits. Experimental economics has explored areas and situations in which individualistic behaviour typically does not realize. (Ariely, 2015) The model of social psychology explores the hierarchy and functioning of cooperation, altruistic behaviour, and the system of norms. (Bereczkei, 2009) Bowles applies the results of social psychology in reflection to Becker's model. Policy measures change an individual's attitude toward individualistic behaviour. The resulting crowding out effect causes a loss of efficiency. Stable market and trust in transactions lead to an effective balance of altruistic and individualistic behaviours. (Bowles, 2018) Fukuyama also draws attention to the impact of trust on social capital. Low levels of trust increase the frequency of illegal, evasive behaviour. (Fukuyama, 2007) Through the institutional system, government exerts direct and indirect influence on compliance behaviour. An unstable institutional system undermines trust in government. It also provides an opportunity for the tacit tolerance of noncompliant behaviour. (Marx, 1978)

We can only talk about VAT fraud after the introduction of VAT in 1988. However, in a socialist economy, the compulsory delivery system (Rév, 1996), the second economy (Gábor & Galasi, 1981) and gratitude money (Ádám, 1986) reduced cooperation, increased suspicion, distrust in government. Activities

contrary to the set of rules laid down the law were tolerated and often supported by the government, which also reduced trust in the government.

During the regime change, a special paradigm system operated in the economy, the transformation lasted until the early 2000s. (Kornai, 1999) During this period, the economic downturn and the transformation of the institutional system, the capital-deficient economy encouraged the development of many forms of noncompliant behaviour. Tax evasion has become widespread. Trust in the government continued to decline. (Sugár & Trautmann, 1995) (Sik, 1997) After the regime change, in the 2000s income taxes and the marginal tax wedge were extremely high. VAT fraud during this period typically meant concealing sales. (Balog, 2014)

Statistical models can be classified into models using aggregates, procedures based on input-output structures, and models using individual data. (Cserháti, et al., 2009) (Murai & Ritzlné Kazimir, 2011)

The illegal activities and tax fraud has been initially ignored in the compilation of national accounts for ethical reasons. As a result of the availability of micro-data and the accuracy needed by the balance sheet reconciliations, the SNA 1993 and the ESA 1995 required the accounting of activities. (EUROSTAT, 1996) (United Nations, 1993) Eurostat's methodological recommendation from 2005 grouped unobserved activities and made methodological recommendations for the selection of the estimation method. (EUROSTAT, 2005)

2.2 Methods used in the research

The primary research is based on quantitative methods, the primary goal of which is to quantify VAT fraud in order to facilitate the production of macro-statistics. To fulfil the basic objective, the alternatives provided by the available statistical toolkit were used in the primary research. The process of primary research lasted from the collection of basic data to the fitting of the panel model. The advantage of quantitative research is that it is repeatable, its results are generalizable, and less subjective. At the same time, a significant disadvantage is that the motivations cannot be explored with the quantitative methodology, the mapping of these was based on the secondary research.

During the secondary research, a comprehensive analysis was made by reviewing the literature in the field. During the processing of the literature, decisive role of cooperation and individualism, trust, as well as the institutional system stood out in the development of noncompliant and thus tax fraudulent behaviour. The following review of economic history reveals how the events of the last decades have undermined the system of cooperation and trust in Hungary and how the change in the institutional system has affected the development of VAT fraud. Finally, the description of the published and recommended methodology for estimating the non-observed economy concludes the processing of the literature.

Primary research rests on two pillars.

On the one hand, mapping, examining, matching, and performing the estimation of individual, enterprise-level databases results in a VAT fraud estimate. I compiled the individual level database from the data of the VAT audit data, the annual report of the enterprises, the VAT return and other variables of the category characterizing the operation. The applicability of individual estimation

was supported by secondary research, which provided convincing arguments that fraudulent behaviour can be traced back to several different factors for both historical and theoretical reasons. From the data of the databases, indicators characterizing the efficiency and relative position of enterprises were calculated. After dealing with the extreme values, the next step was to test the distribution of indicators and their relationship to tax fraud. This was followed by estimation, validation and preparation of results for second pillar studies.

The second pillar contains a panel estimate applied to the results. The panel model examines whether economic growth has a detectable effect on the evolution of VAT fraud. The basis of the research is the estimation result, according to which the rate of VAT fraud compared to the theoretical (VTTL) VAT liability decreases after 2012. There may be two determinants of this, if the specific individual factors are considered constant: economic growth and the complex, multi-sectoral interventions of the government to reduce tax fraud. The relationship between the two pillars is shown in Figure 1 below.

Figure 1: The relationship between the two pillars of the primer research
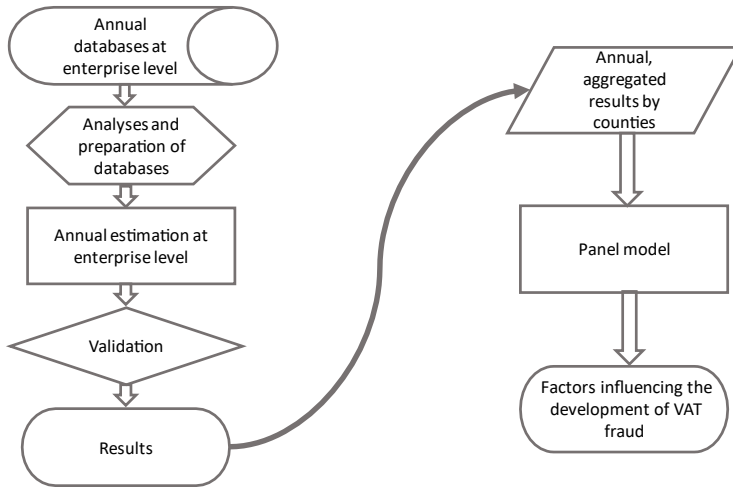
Source: Own editing

In order to fulfil the basic objective, the possibilities provided by the available statistical toolkit were used in the primary research. The primary research lasted from the collection of baseline data to the fitting of the panel model.

2.2.1 Methodological choices in relation to secondary research

Many different terminologies are used in relation to tax fraud and the non-observed economy, there are overlaps between concepts, and misunderstandings as well as inappropriate usage of terms are often observed during use. The payment of VAT and the compilation of national accounts are also regulated, and a review of these is essential in order to clarify the usage of the term during the research. This section also presents guidelines and handbooks published by a number of professional organizations (UN, Eurostat, OECD) that do not qualify

as scientific literature but are unavoidable due to their usage, approach and publicity.

The secondary research consists of three additional parts. The three areas were published and documented in the form of a review article. First, the structure of the theoretical framework helps to understand the diversity of attitudes. (Ritzlné Kazimir, 2017) The review of economic history reveals how institutional changes have influenced the development of trust and willingness to cooperate. (Ritzlné Kazimir, 2018) Finally, the section presenting the estimation methods describes the methodology of non-observed economy estimates, as published in the domestic and international literature. (Murai & Ritzlné Kazimir, 2011)

Secondary research has shown that noncompliant behaviour is influenced by a number of factors, out of which the societal norm system and social capital are slow to evolve and difficult to change. Because of this, noncompliant behaviour may vary from country to country. For this reason, the Hungarian historical review became necessary. Finally, based on the conclusions of the review of the two areas and the documents regulating the compilation of national accounts, it can be concluded that none of the estimation methods presented in the international literature is suitable for a detailed estimation of VAT fraud.

2.2.2 Methodological choices in relation to primary research

The methodological choice fell on methods using individual data in the light of the secondary research reviewing the estimation literature. On the one hand, models based on aggregates are less able to grasp the diversity of the phenomenon, and on the other hand, conceptual delimitations are more difficult to implement. Finally, the estimates made in this way are not directly suitable for national accounts purposes.

The most important document for compiling the non-observed economy (EUROSTAT, 2005) makes methodological recommendations for estimating the non-observed economic performance due to deliberate misreporting. Accordingly, the use of tax audit data is one of the recommended methods. However, based on the Commission Decision No 94/168, the usability of fiscal audits must be investigated for improving non-observed economic estimations.

Fiscal audit datasets cannot be considered as samples in the statistical sense, organizations are selected from the target groups defined in the audit strategy of the tax authority, using several algorithms. Therefore, it is methodologically substantiated to perform the estimates at the lowest possible level of aggregation in order to avoid sampling bias as much as possible. Due to the availability of individual data, the choice of the estimation methodology fell on the estimation at the individual level. Methodological literature containing an estimate of VAT fraud at the individual level was not available. Therefore, it was necessary to build a completely new model. The methodology used in the statistical model covered the following areas:

- Matching of databases, calculation of ratios, indices, category variables
- Filtering outliers
- Examination of distributions
- Testing the strength of connections
- Execution of a nonparametric, machine learning procedure
- Validation of results
- Deflating and chain-linking of data
- Fitting of panel model

At the same time, the implementation of the estimation in a step-by-step manner has been defined by the above-mentioned areas and has been separately carried out for the selected years (period 2006-2016), the estimation process has been completed for each year.

The validation of results for such a sensitive phenomenon is a complex issue. VAT gap estimates published by the European Commission from the supply and use tables were used for validation. (Reckon, 2009)

3. Results of the dissertation

Both primary and secondary research have yielded tangible results.

3.1. Results of literature research

The results of the literature research were the first to help build and understand the theoretical model

3.1.1. Synthesis of theoretical approaches

Examining noncompliant behaviour from an economic approach touches on several disciplines. After reviewing the possible models, it became clear that there are several levels of motivations resulting in noncompliant behaviour, and the individual decision is formed by the complex interaction of these levels.

> **Noncompliant behaviour is determined by personality traits, the strength of relationships based on reciprocity, the system of norms and the institutional system; the resulting attitude is stable over time and is closely related to the level of trust in the government.**

Cooperation and noncompliant behaviour can be seen as complementary. The first, personal level of cooperation is determined by personality traits, which are largely inherited.

The second level characterizes the behaviour of the individual within the group. The individual within the group can be individualistic or cooperative. Individuals cannot be categorized as exclusively individualistic or cooperative. Both individualism and cooperation are forms of behaviour that can be explained by evolutionary processes that both serve the interest of the individual. Individualistic behaviour is aimed at maximising the directly measurable, short-term utility of the individual, while altruistic behaviour represents long-term, directly not measurable utility through group stability and strengthening an individual's status within the group.

A system of norms does not refer to individual behaviour defined by the behaviour of each individual, but a set of rules containing standards commonly agreed upon by the group. In the interpretation of the institutional system used in the dissertation includes the specific system of rules and expectations in a wider community, the observable regularity of behaviour, and the willingness to interpret. The institutional system, like the system of norms, contains the expected, permissible forms of behaviour. The government is the active determinant and shaper of the institutional system.

The government can shape the institutional system both directly and indirectly. Direct shaping is done by legislation, indirect shaping lies in the communication of the government and its reaction to the problems of individuals and groups. Non-authentic government reaction, failure to action, or double communication

undermines trust in government and, at the same time, reduces willingness to cooperate.

The above system of relationships, which creates a noncompliant attitude, is stable and difficult to change.

3.1.2. Development of cooperation and violation of rules in the context of economic history

The dissertation analyses the events that influenced the level of noncompliant behaviour and the ability to cooperate, starting from the theoretical overview. After reviewing the events, the explanation for the high level of tax fraud is summarised below.

> **The high level of tax fraud in Hungary during the period of socialism and regime change was determined by the disintegration of communities, the decline in the general level of trust, and the tacit consent of the government in many cases of illegal and noncompliant behaviour.**

In Hungary, the market economy developed relatively late, and reciprocity played a significant role in rural communities, as in other Eastern European countries. In the 1940s, the introduction of the compulsory storage system, as well as the development and unsustainability of the planned economy had a devastating effect on the community.

Trust was negatively affected by activities that developed in parallel with the second economy. Subjective assessments of the relative prosperity of those operating in the second economy decreased trust and had a negative impact on performance.

In the period of the regime change, the specific forms of capital accumulation due to the lack of capital in many cases exceeded or approached the limit of illegality. Activities that seriously violated the norm and the institutional system reduced the level of general trust. This was due to the apparent inertia of the government, the judgement of which was aggravated by usual and expected governmental care in the previous system.

The dual communication of the government, that is, the contradiction between laws and real behaviour, also contributed to the development of the institutional system during the socialism and the regime change. Dual communication already appeared during the establishment of gratitude money, when activities prohibited by law were legitimised by the government in such a way that they remained prohibited. In the period of the regime change, the government continued to implement the practice of double communication by encouraging business contracts creating hidden employment and tacitly supporting tax fraud, which openly took place during sales. This phenomenon has increased suspicion in the government and weakened the strength of the regulatory environment as part of the institutional system.

The period of regime change lasted until the beginning of the 2000s, and it was not possible to bring the unsettled period to an end in the first decade due to the onset of the 2008 crisis. By this time, VAT fraud had significant external costs due to its deep integration into the global value chain, and action against it became necessary.

3.2. Results of primary research

The results of the primary research can be divided into three groups. The first is to set up the estimation model supported by the appropriate methodology, the

second is to evaluate and validate the results and the third is to fit and evaluate the panel model.

3.2.1. Estimation

A review of the literature on estimation methodology revealed that there is no published methodology that simultaneously meets the objectives of national accounts, has an appropriate conceptual delimitation, and results in a sufficiently detailed estimate. Therefore, it became necessary to develop a new model.

> **The result of VAT fraud estimation by the kNN procedure using the administrative data deriving from the tax audit and tax return data fitted to the individual dataset is conceptually well delimited and detailed, in line with the objectives of the national accounts.**

In order to determine the extent of VAT fraud, it is necessary for the data to be detectable between institutional sectors and activities in detail, to fully cover VAT fraud, but not to include the results of other activities, and to regard domestic economic activity. VAT fraud can take many different forms in practice, so the bottom-up methods presented in the methodological review are not appropriate because they can only cover a specific dimension of VAT fraud. In case of models estimating aggregates, detail and conceptual delimitation are compromised.

The use of VAT audit data also ensures the widest possible coverage for the areas of VAT fraud, and realises both conceptual delimitation and the account of domestic economic activities. The use of individual data also ensures adequate detail and full coverage. The use of administrative data is obvious in the estimation process.

Tax audit and administrative data are not statistical data; therefore, they can be used after data cleaning only. Examining the distribution of variables in the VAT audit dataset was necessary to test the relationship between VAT fraud and other variables. Based on tests and analysis, the population of VAT evaders and non-evaders can be well distinguished along the variables involved. However, the relationship between the hidden VAT and the available variables cannot be clearly defined.

There are several reasons for this. On the one hand, due to the activities of tax fraudsters and the implementation of fraud, the population is multimodal, that is individual groups cannot be separated on the basis of available information. Furthermore, in the period under review, tax fraudsters reacted to the communication of the tax authority, to the changed economic and institutional environment, and their behaviour is not stable over time. In addition, VAT audit data cannot be considered as a sample, since they do not represent the entire population. For these reasons, parametric statistical procedures are not applicable in this case.

Among the non-parametric statistical methods, the neural network algorithm and the kNN (k Nearest Neighbour) method corresponded to the target imputation task, but the use of the neural network did not yield evaluable results. However, running the kNN procedure led to a satisfactory result.

3.2.2. Results of estimation

After the estimation for the period from 2006 to 2016, it became necessary to evaluate and validate the results. However, no control data are available on VAT fraud. Therefore, the validation was based on the European Commission's VAT gap estimate.

The rate of VAT fraud estimated using the VAT audit data followed the trend of the rate of VAT gap between 2006 and 2016, rising from 15% in 2006 to 29% in 2011, continuously decreasing from 2012 to 2016, when it reached the 10% level.

The development of the VAT gap is not satisfactory for measuring the level of the VAT fraud, but it is suitable for identifying its trends. The VAT gap is not equal to the VAT fraud, because the VAT gap includes several items, which do not arise due to noncompliant transactions. However, the VAT gap and the estimated VAT fraud rate in the research are similar, with the European Commission's estimate being higher in all years examined, with the exception of the 2008 outlier. The trend of the VAT gap indicator also supports the development of the VAT fraud estimate.

In parallel with the domestic government crisis, the rate of VAT fraud increased further with the onset and deepening of the global economic crisis. It reached a level of almost 30% in 2011. At that time, due to the systematic measures of the government covering several areas and the recovery of economic growth, the rate of VAT fraud started to decrease, the decline continued unabatedly until reaching the level of 10% in 2016.

3.2.3. Panel model

The detailed results of VAT fraud can serve as a basis for a number of further studies. Out of these, the dissertation analyses the regional development of the VAT fraud rate using the panel model and also examines the relationship between the VAT gap and the economic development.

At the macro level, the rate of VAT fraud can be explained by GDP per capita, the lagged rate of VAT fraud and the shocks caused by economic crises.

Based on the regional data, the estimated VAT gap in 2006 was higher in the south-eastern part of the country; the highest value was observed in Nógrád county. The economic crisis changed the order, by 2012 the previously low-VAT-fruad-ratio Budapest and Pest county lost their favourable positions. The relative positions of Hajdú-Bihar county and Jász-Nagykun-Szolnok county improved, Nógrád county maintained the position of the county with the highest VAT fraud rate. The post-crisis recovery led to a further rearrangement of county rankings, due in part to an increase in the weight of multinational corporations and a reduction in VAT fraud on agricultural products through a reduction in the tax rate and the application of reverse charge.

The applied panel model was fitted to NUTS2 level regions. The explanatory variables were GDP per capita, the dummy variable for crisis years, and a lagged VAT fraud rate. In the model, the VAT fraud rate was the dependent variable. The crisis dummy variable for the years 2008-2012 took on a unit value.

Based on the results of the model fitting, the uncertainty associated with the economic crisis increases the regional VAT fraud rate by almost 14 percentage points, all other factors being constant. The relationship between the GDP per capita at constant prices and the VAT fraud rate is negative, a unit increase in the GDP per capita at constant prices reduces the VAT fraud rate by 4 percentage points. Finally, the VAT fraud rate depends on its own previous value. This may be due to the fact that VAT fraud cannot be separated from

transactional networks. Incorporating VAT fraud into transaction networks can have relatively lasting effects.

3.3. Summary of research results

The following hypotheses were examined during the research.

Table 1: The hypotheses of the research

Hypothesis	Decision
H1: The motivations for VAT fraud are manifold, influenced by both time-stable and short-term changing factors.	Accepted
H2: The development of cooperative and rule-following behaviour is influenced by long-term events affecting trust and social capital.	Accepted
H3: Based on the diversity of motivations, historical differences between countries, institutional changes and the requirements for compiling national accounts, this non-parametric machine learning kNN procedure based on individual data is suitable for estimating VAT fraud.	Accepted
H4: In Hungary, VAT fraud has decreased due to the strong, targeted and clear action of the government.	Accepted
H5: In Hungary, the rate of VAT fraud is reduced by economic growth, while in the crisis and in previous periods the effect of VAT fraud is positive.	Accepted

4. Practical application of the research results

The practical application of the research appears in three areas.

First, an individual-level statistical model based on administrative data will facilitate a similar use of administrative data in the future, insofar as it also provides a practical example for the preparation, clearing and processing of data.

Second, the model built as a result of the research addresses the problems caused by systematic sampling and also includes the preparation of administrative individual data for statistical use. The statistical model provides a good practical example of using administrative, non-statistical data and making estimates.

Third, the estimation procedure developed during the research quantifies VAT fraud, the resulting estimate is homogeneous, consistent and sufficiently detailed. It follows the changes in the examined period well and provides a good input for further investigation of VAT fraud. The results of the estimation allow an accurate accounting of VAT fraud in the national accounts and a proper estimate of the – due to VAT fraud – non-observed value added. This result will make it possible for all users of official statistics (economic policymakers, researchers, analysts, other economic professionals) to obtain more relevant macro-statistical data. Based on the detailed results, the research identified three of the core factors influencing the VAT fraud rate:

- economic growth
- crisis
- VAT fraud rate in previous periods

Given its limitations, the research has contributed to the study of the field in at least three areas:

- an entirely new statistical model for estimating VAT fraud based on individual administrative data
- VAT fraud development estimation Hungary for the period between 2006 and 2016
- verification of effect of behavioural stability, economic growth, and crisis on VAT fraud rate of.

During the research, new questions arose, which the dissertation did not examine for reasons of length; these questions will be revealed as a continuation of the research:

1. How did Missing Trader VAT fraud and domestic VAT fraud develop during the period under review? *Planned activity: Missing Trader VAT fraud estimation, analysis of the development of VAT fraud affecting foreign trade and domestic production.*

2. How did Missing Trader VAT fraud and domestic VAT fraud affect national accounts indicators during the period under review? *Planned activity: Estimation of non-observed value added, exports and imports, in view of development of Missing Trader VAT fraud and domestic VAT fraud. Examination of sector account items in the light of VAT fraud results.*

3. At the macro level, what are the causes and consequences of VAT fraud in Hungary? *Planned activity: Exploration the causes and consequences of VAT fraud using Structural Equation Modelling.*

5. Main references

1. Ádám, Gy. (1986). Az orvosi hálapénz Magyarországon. Budapest: Magvető Kiadó.

2. Allingham, M. G., & Sandmo, A. (1972). Income Tax Evasion: a Theoretical Analysis. *Journal of Public Economics 1*, 323-338.

3. Ariely, D. (2015). *Az (őszinte) igazság a hazugságról. Hogyan csapjuk be önmagunkat és másokat?* Budapest: HVG Kiadó.

4. Balog, Á. (2014). Adóelkerülés és rejtett gazdaság Magyarországon. *Köz-Gazdaság*, 15-30.

5. Becker, G. (1974). Crime and punishment. In G. Becker, & W. Landes, *Essays in the Economics of Crime and Punishment* (old.: 1-54). New York: Columbia University Press.

6. Bereczkei, T. (2009). *Az erény terméeszete Önzetlenség, együttműködés, nagylelkűség.* Budapest: Typotex.

7. Bowles, S. (2018). *Az etikus gazdaság. Miért nem helyettesíthetik a jó ösztönzők a jó állampolgárokat.* Budapest: Pallas Athéné Könyvkiadó Kft.

8. Cserháti, I., Dobszayné Hennel, J., Keresztély, T., Péter, Á. I., Takács, T., & Varga, Z. (2009). *A rejtett gazdaság mérése és visszaszorításának lehetőségei A gazdaságelemzés módszerei 1. sz. .* Budapest: ECOSTAT.

9. Európai Bizottság. (2018). Study and Reports on the VAT Gap in the EU-28 Member States: 2018 Final Report. Letöltés dátuma: 2019. október 15, source: https://ec.europa.eu/taxation_customs/sites/taxation/files/2018_vat_gap_report_en.pdf

10. EUROSTAT. (1996). *European system of accounts.* Brussels, Luxembourg: EUROSTAT.

11. EUROSTAT. (2005). *Eurostat's Tabular Approach to Exhaustiveness. Guidelines.* Luxembourg: EUROSTAT.

12. EUROSTAT. (2013). *European system of account – ESA2010.* Luxembourg: EUROSTAT, European Commission.

13. Fukuyama, F. (2007). *Bizalom.* Budapest: Európa Könyvkiadó.

14. Gábor, R. I., & Galasi, P. (1981). *A „második" gazdaság.* Budapest: Közgazdasági és Jogi Könyvkiadó.

15. Kornai, J. (1999. július-augusztus). A rendszerparadigma. *Közgazdasági Szemle, XLVI. évf.*, 585-599.

16. Marx, K. (1978). *A tőke. A politikai gazdaságtan bírálata. Első kötet I. könyv A tőke termelési folyamata.* Budapest: Kossuth Könyvkiadó.

17. Reckon. (2009. Szeptember 9). *Study to quantify and analyse the VAT gap in the EU-25 Member States.* Source: https://ec.europa.eu/taxation_customs/sites/taxation/files/docs/body/reckon_report_sep2009.pdf

18. Rév, I. (1996). Az atomizáció előnyei. *Replika 23-24*, 141-158.

19. Sik, E. (1997). A kgst-piachely a mai Magyarországon. *Közgazdasági Szemle, XLIV. évf*, 322-338.

20. Sugár, A., & Trautmann, L. (1995. január 1). A rejtélyes szektro - a második, az informális és a rejtett gazdaság természetéről. *Eszmélet.* Downloaded: 31. January 2021, source: https://www.eszmelet.hu/trautmann_laszlo-a-rejtelyes-szektor-a-masodik-az-informa/

21. United Nations. (1993). *System of National Accounts 1993.* Brussels/Luxembourg, New York, Paris, Washington, D.C.: United Nations.

6. List of publications

6.1 List of own (or co-authored) publications on the topic

6.1.1 Journal papers

1. Máténé Bella Klaudia - Ritzlné Kazimir Ildikó (2020): A gazdasági és a szabályozási környezet változásának hatása az áfaelkerülés 2006 és 2016 közötti alakulására Magyarországon STATISZTIKAI SZEMLE 98 : 2 pp. 107-132. , 26 p. (2020)

2. Ritzlné Kazimir Ildikó (2017): Az adóelkerülés elmélete KÖZ-GAZDASÁG 12 : 4 pp. 257-268. , 12 p. (2017)

3. Ritzlné Kazimir Ildikó (2014): The Estimation of Gross Value Added of Sole Proprietors for 2011 in Hungary STATISZTIKAI SZEMLE special number : 18 pp. 89-109. , 21 p. (2014)

4. Ritzlné Kazimir Ildikó (2013): Az egyéni vállalkozók hozzáadott értékének számítása STATISZTIKAI SZEMLE 91 : 7 pp. 691-717. , 27 p. (2013)

5. Murai Bálint - Ritzlné Kazimir Ildikó (2011): A nem megfigyelt gazdaság mérésének lehetőségei STATISZTIKAI SZEMLE 89 : 5 pp. 501-522. , 22 p. (2011)

6.1.2. Conference publications

6. Ritzlné Kazimir Ildikó (2018): Is the Hungarian Non-Observed Economy Rooted in Socialism? In: IARIW 35th General Conference (2018) pp. 1-13. , 13 p.

7. Ritzlné Kazimir Ildikó (2013): The Undeclared Value Added Due to the Value Added Tax Evasion of Sole Proprietors In: International, Statistical Institute (szerk.) Proceedings of the 59th World Statistics Congress of the

International Statistical Institute The Hague, Hollandia : International Statistical Institute, (2013) pp. 1-6. , 6 p.

8. Ildiko Ritzlné Kazimir - Gergely Horváth - Johanna Giczi (2012): Modeling tax evasion of the self-employed in Hungary In: SMTDA (szerk.) Proceeding, 2nd Stochastic Modeling Techniques and Data Analysis International Conference Chania, Görögország (2012) pp. 349-357. , 9 p.

6.2 List of other publications

9. Máténé Bella Klaudia - Ritzlné Kazimir Ildikó – Cseh Tímea (2021): Áfaalapú diffúziós index a konjunktúrakutatásban STATISZTIKAI SZEMLE 99: 3 pp. 207-232. 26 p. (2021)

10. Máténé Bella Klaudia - Ritzlné Kazimir Ildikó (2020): A multinacionális nagyvállalatok stratégiai döntéseinek hatása a termelés oldali GDP alakulására STATISZTIKAI SZEMLE 98: 3 pp. 212-241. 30 p. (2020)

11. Máténé Bella Klaudia - Ritzlné Kazimir Ildikó (2020): A magyarországi fogyasztás tartósság szerinti vizsgálata 2005 és 2019 között In: Temesi József (szerk.) XVI. Gazdaságmodellezési Szakértői Konferencia: Előadások Pécs, Magyarország: Gazdaságmodellezési Társaság, (2020) pp. 109-117. 9 p.

12. Ritzlné Kazimir Ildikó (2020): Végtelen álmok- egy játék, amely megváltoztatta az innovációt azáltal, hogy forradalmian új megoldásokat, új üzleti és gazdasági modelleket és egy teljesen új munkamódszert hozott létre KÖZ-GAZDASÁG 15: 2 pp. 76-79. 4 p. (2020)

13. Máté-Bella Klaudia - Ritzl-Kazimir Ildikó (2019): Analysis of the Hungarian insurance sector's gross value added from 2003 to 2017 HUNGARIAN STATISTICAL REVIEW: JOURNAL OF THE HUNGARIAN CENTRAL STATISTICAL OFFICE 2: 2 pp. 79-105. 27 p. (2019)

14.   Máténé Bella, Klaudia - Pinkasz, András - Ritzlné Kazimir, Ildikó (2019): Analysis of the development of the Automotive Cluster and its Impact on Economic Growth in Central and Eastern Europe between 2013 and 2018 In: Experiences and Future Challenges in Measuring Income and Wealth in CIS Countries and Eastern Europe (2019) pp. 1-24. 24 p.

15.   Máténé Bella Klaudia - Ritzlné Kazimir Ildikó - Sugár András (2019): A magyarországi konjunktúrakutatás rövid történeti áttekintése STATISZTIKAI SZEMLE 97: 6 pp. 521-545. 25 p. (2019)

16.   Pinkasz András - Ritzlné Kazimir Ildikó (2019): Profiling of the Hungarian participation in the global automotive value chain In: Group of Experts on National Accounts: Measuring Global Production (2019) pp. 1-8. 8 p.

17.   Ilona Cserháti - Tibor Keresztély - Ildikó Ritzlné Kazimir (2018): The recent role of government in decreasing "harmful inequality" In: "Better Statistics for Better Lives": Jointly organised with OECD (2018)

18.   Ritzlné Kazimir Ildikó - Murai Bálint - Anwar Klára - Száraz Anikó - Salamon Anikó (2016): Analysis of Productivity Trends in 'Manufacture of Motor Vehicles' Industry in Hungary between 1995 and 2014 In: International, Association for Research in Income; Wealth (szerk.) IARIW 34th General Conference (2016) pp. 1-14. 14 p.

19.   Ritzlné Kazimir Ildikó (2011): The economic processes and the migration In: Bexheti, Abdylmenaf; Hashrova, Albana; Kreso, Sead; Meyer, Dietmar; Wenzel, Heinz-Dieter (szerk.) Development and Economic Policy: Ninth European Doctoral Seminar (EDS) -- Seminar Volume Bamberg, Németország: J. Berg Verlag, (2011) pp. 353-365. 13 p.

20.   Ritzlné Kazimir Ildikó (2009): The monopolistic competition in Walras–Leontief-model In: Meyer, Dietmar; Kola, Tonin; Kreso, Sead; Bexheti, Abdylmenaf; Wenzel, H -Dieter (szerk.) Government and Private Sector in Transition Economies: 8th European doctoral seminar Bamberg, Németország: J. Berg Verlag, (2009) pp. 93-114. 22 p.

21.   Ritzlné Kazimir Ildikó (2008): The matrix multiplier in open economies In: Meyer, Dietmar; Haderi, Sulo; Kreso, Sead; Bexheti, Abdylmenaf;

Wenzel, H -Dieter (szerk.) Transformation in the Light of Theory and Globalization: 7th European doctoral seminar Bamberg, Németország: J. Berg Verlag, (2008) pp. 31-42. 12 p.

22. Ritzlné Kazimir Ildikó (2007): The matrix-multiplier In: Meyer, Dietmar; Haderi, Sulo; Kreso, Sead; Wenzel, H -Dieter (szerk.) Economic structure and institutions: sixth European Doctoral Seminar (EDS) Bamberg, Németország: J. Berg Verlag, (2007) pp. 232-242. 11 p.

23. Ritzlné Kazimir Ildikó (2007): A demográfiai átmenet hatása a Magyarországon kialakult regionális különbségekre In: Iványi, M; Bancila, R (szerk.) Bridges in Danube Basin: 6th International Conference on Bridges across the Danube Budapest, Magyarország: Műegyetemi Kiadó, (2007) pp. 126-133. 8 p.

24. Ritzlné Kazimir Ildikó (2006): The reasons for inequality between economies In: Meyer, Dietmar; Haderi, Sulo; Kreso, Sead; Nardini, Franco; Wenzel, H -Dieter (szerk.) Challenges to change - Middle and Eastern European countries in transition: Fifth European Doctoral Seminar (EDS) Bamberg, Németország: BERG-Verlag, (2006) pp. 107-117. 11 p.

25. Ritzlné Kazimir Ildikó (2006): A regionális különbségek és a népesség alakulásának kapcsolata In: Szentes, Balázs (szerk.) Tudás és versenyképesség pannon szemmel 1 -2. kötet: Pannon Gazdaságtudományi Konferencia Veszprém, Magyarország: Pannon Egyetemi Kiadó, (2006) pp. 179-183. 5 p.

26. Ritzlné Kazimir Ildikó (2005): Néhány decentralizált mechanizmus összehasonlítása a kísérleti közgazdaságtan eszközeivel In: Dobricza, Anikó; Lados, Mihály; Limpók, Valéria; Takács, Dávid - Solt, Katalin (szerk.) Kísérleti közgazdaságtan Győr, Magyarország: Széchenyi István Egyetem, Gazdaság- és Társadalomtudományi Intézet, (2005) pp. 9-29. 21 p.

27. Ritzlné Kazimir Ildikó (2005): Közösségi javak - néhány decentralizált mechanizmus összehasonlítása a kísérleti közgazdaságtan eszközeivel TUDOMÁNYOS FÜZETEK 8: 1 pp. 9-29. 21 p. (2005)

28. Ritzlné Kazimir Ildikó (2004): A kísérleti közgazdaságtan főbb irányzatai és eredményei összehasonlítása pp. 106-115. 10 p. In: Majoros, Pál (szerk.) Tudástranszfer és információs társadalom Budapest, Magyarország: Budapesti Gazdasági Főiskola, (2004)