# ANALYSIS OF NON-TAX REVENUE: EVIDENCE FROM EUROPEAN UNION

**Volkan Yurdadoğ[1], Neslihan Coşkun Karadağ[2], Murat Albayrak[3*], and Oğuzhan Bozatlı[4]**

[1) 2)3)] *University of Çukurova, Adana, Turkey*

[4)] *University of Osmaniye Korkut Ata, Osmaniye, Turkey*

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**Abstract**
The challenges states face in reducing government expenditures under certain budget constraints are putting pressure on states to increase their revenues. Given that taxation also has a limit, the importance of non-tax revenues (NTR) in financing growing government expenditures increases day by day. In this sense, our study first analyzes the historical and theoretical foundations of NTR in the European Union (EU). Subsequently, from 1995 to 2018, NTR's determinants and their interrelationships were analyzed using panel data analysis and panel causality methods. The findings point to statistically significant and robust effects of general and central government expenditures (except local government expenditures), tax revenues, and GDP on the NTR. According to panel causality results, there is unidirectional causality from independent variables (General, Central and Local Government Expenditure, Tax Revenue, GDP) to NTR, and unidirectional causality from NTR to independent variables (except GDP). In other words, there is bidirectional causality between NTR and independent variables, except for GDP.

**Keywords:** Non-Tax Revenue, Panel Data Analysis, Panel Causality, European Union

**JEL Classification:** H20, H27, C23

* Corresponding author, **Murat Albayrak** – e-mail: mrtlbyrk055@gmail.com

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## Introduction

One of the most important discussion topics in macroeconomics is the relationship between government revenues and expenditures. There are various political, social, and economic functions that a modern state is expected to perform. In time, these functions, especially the state's economic activities, have increased extensively and intensively. For example, population growth, demographic changes, income growth, and globalization have increased government expenditure. Under these circumstances, recent increases in budget deficits in developing and developed countries have become even more evident. It should be noted that government expenditure is the impetus of economic development and increases society's welfare (Sharma and Kulshrestha, 2015, p.1; Ullah, 2016, p.1).

Regardless of their characteristics, all states face challenges in providing government expenditures, which aim to ensure society's welfare and safety. However, the scarcity of resources of governments around the world has forced them to increase their revenues. Achieving sustainable revenue is vital to maintaining a presence, no matter what institution it is. Any government that fails to meet the basic requirements for sustainable growth is considered to have failed. For this reason, governments around the world strive for necessary revenue to provide services to their societies (Onyekwelu, Chineke and Iroegbu, 2018, pp.62-63). In short, governments need a substantial amount of funds to achieve the desired development goals, finance budget, and increase economic growth (Yanti, Susetyo and Saftiana, 2020, p.111).

In modern tax states, taxes are the main financing source for government expenditures. However, as mentioned above, the increase in the state's functions and the need for resources reveal non-tax revenues (hereafter NTR) importance. Governments finance some of their expenditures from taxes and some from NTR sources. The primary non-tax sources are property income, including dividend share and profit share from state enterprises, and grants from international organizations and foreign governments (Ivanyna and Haldenwang, 2012, p.22; Chebeň et al., 2021, p.467).

It can be said that there are very few theoretical and empirical studies on NTR in both developed and developing countries. This is perhaps not surprising because NTR typically consists of a very heterogeneous mix of resources. Thus, its share in total government revenues is relatively small. It is suggested that they have a limited role in influencing macroeconomic conditions in comparison to the main sources of taxation (Mourre and Reut, 2019, p.199). When the few existing studies on NTR are examined, it is observed that they have generally focused on disaggregate revenue types such as foreign aid or oil revenues.

Within this framework, our study aims to take its place among the pioneering studies that examine different types of NTR as a whole. As mentioned above, due to the trend of increasing government expenditures, states need more budget financing resources. As there is a limit to taxation, the importance of NTR will increase even more soon. Therefore, our study aims to analyze NTR in the EU, both theoretically and empirically. The determinants of NTR in EU member states, and the kind of relationship between these determinants will be examined by employing both panel data analysis and panel causality methods. Therefore, the main purpose of this study is to contribute theoretically and empirically to fill the gap in the literature on NTR. The study will first focus on NTR and NTR classification within the EU ESA 2010 standards framework. The next section will examine the development of NTR

in the EU. Finally, it will present an empirical analysis of NTR in the EU and conclude the article with results and suggestions.

## 1. The theoretical analysis of NTR

Today, it is argued that NTR may have various effects on the economy. NTR may play an essential role in improving control of macroeconomic variables at the national level, encouraging the activities and development of local governments, compensating for budgetary shortcomings, and ensuring society's welfare. NTR are inseparably linked with economic growth, just as tax revenues. While discussing the NTR problem, the NTR should not be viewed in isolation; there should be a comprehensive and systematic study on the concept, its form, as well as its scale (Zhang and Huang, 2019, pp.35-36).

Since the ratio of NTR to total fiscal revenue is not high in most countries, very few academics analyze NTR. More importantly, most countries do not have NTR terminology, and NTR only exists as the concept of fiscal revenue and expenditure. Therefore, researchers focus more on user fees (Yu, Haiying and Yi, 2012, p.51). However, the concept of NTR is much more comprehensive. Therefore, the NTR should be well defined and classified.

### 1.1. The concept of NTR and features

When it comes to determining the essence of government revenues, it is inevitable to link the government revenues to government expenditure. There exists an organic, and thus naturally inseparable connection between them. Government revenue exists for the single purpose of meeting public expenditures. In other words, government expenditures take precedence over government revenues and determine the existence of government revenues. The priority principle of public expenditures means determining the resources to meet the expenditures. This is the way the budget is planned, and the budget is designed to meet public needs financially and perform public functions. The state has different ways of generating revenue, from direct confiscation of property (through the release of new taxes or raising rates or expropriation) to market mechanisms (sale of state property, use of state ownership for revenue, the imposition of a state monopoly on specific activities, etc.). Therefore, the sources of public income are diverse and continuously renewed (Komyagin, 2015, pp.3-4).

Governments need economic resources to fulfil their functions such as allocation, redistribution, and stabilization. These sources represent government revenue in a broad sense. This revenue is quite heterogeneous. This group of revenue sources can be grouped under two main titles: taxes and NTR. Tax revenue consists of compulsory and unrequited government revenues. This means that taxes are not a direct payment for a particular service or good provided by the central government or government administrations. Generally, all other government revenues are NTR. According to Morrison (2009, p.114), NTR includes not only foreign aid, natural resource revenue, and borrowing (from abroad and the central bank), but also all revenue other than taxation. Essentially, NTR revenue is the amount the government can spend without having to tax its citizens. In developing or developed countries, NTRs of various countries generally include administrative fees, government funds, revenue from government assets, fines and confiscation revenues, revenues from the organization of lottery (Morrison, 2009, p.114; Contreras, Triguero and Riera, 2018, p.1; Zhang and Huang, 2019, p.36).

It is relatively easy to analyze countries that generate revenue from natural resources. The best example of this is Norway, where most of the country's revenues are generated by taxes and oil company shares (Holmøy, 2006, p.3). But in terms of natural resources, most countries are not as lucky because governments have to earn a lot of revenue other than taxes to finance the expenditures.

Considers comprehensive theoretical description of NTR, the simplest way to calculate the total value of such revenue is to subtract the total tax revenue from the total expenditure. This form of calculation provides, according to Morrison (2009, p.114), a direct measure of revenue other than tax revenue that the government can use to fund expenditures.

Today, tax revenues have a high share in the government budget. However, a brief observation of European fiscal history is enough to see that tax revenues have a smaller share. Until recently, taxation was viewed as an exceptional fiscal instrument. Historically, the most important source of non-tax income in Europe has been the revenues obtained from royalty (royal lands, mansions, forests, and rivers). Rental incomes and profits from the sale of surplus in these areas have long been considered vital to the primitive economy (and therefore public finance). In addition to these royal revenues, there were many other types of NTR. As Schumpeter argued, the early modern ruler could earn income from the minting of coins, hunting and mining, fees from trade, and the privileges obtained from numerous feudal lords. Besides, fees collected from judicial affairs and numerous fines, gifts, and tributes given by allies, and various contributions from clergymen were also among these revenues (Nilsson, 2017, pp.33-34).

These sources of revenue may not have been approved at the time. However, many philosophers attribute the government's avoidance of regular taxation to being both fiscally precautionary motive and morally preferable. In the 16th century, Jean Bodin described revenues from royalty as "the most defensible and most reliable of all sources of revenues". Moreover, Bodin stated that "the ruler should never apply to taxes until all other sources of revenue are insufficient", reflecting that taxation was not favored at that time, instead, NTR were more important. Meanwhile, some empirical studies have revealed that NTR had an essential place and effects in the budgets of European states for a long time. Michael Mann has explored the shares of "state ownership" in a 19$^{th}$ century-example of a state budget. The data he collected revealed that as industrialization progressed, some states profited greatly from postal monopolies, mining enterprises, toll booths on roads and canals, and state-owned railway companies. For example, Prussia was at the forefront with state ownership of about 70% of the total revenue in 1910, while this share was around 40% for Austria and France, and around 15-20% for the UK and the USA. By the end of the 1980s, it seems that even in the budgets of many wealthy Western states, trade revenues had a significant share and, in some cases, this amount reached 15-20 percent of gross revenue. But with industrialization, it has also been an indisputably accepted phenomenon that the "tax state" has become dominant in Europe. Therefore, the reason why NTRs are neglected in Europe over time is the dominance of taxation proponents (Nilsson, 2017, pp.35-39).

In the light of the definitions, we can list the main features of NTR as follows (Karačić, Bukvić and Mladena, 2017, p.56):

- They are allocated for certain uses;
- They are linked to specific economic activities;

• They are charged according to the determined tariffs, price lists of services or regulations;

• Not paid by all taxpayers;

• Partially have similar economic effects to tax collection;

• NTR another significant source of income for local governments.

Besides these features, providing revenue mobility via NTR sources is a key factor for development. However, in the recent past, it has been proposed to maintain the level of government expenditure and eliminate inefficient expenditure. Several measures have been investigated to reduce government expenditure, but adoption and/or implementation of these measures proved politically impossible. So, it is clear that additional funding is required to cope with the increased expenditure. In such cases, the foremost goal of fiscal policy is to develop additional resources to fund public finance. In this direction, NTR sources become important. Acquisition of these resources can be achieved by improving the efficiency and productivity of the revenue administration, ensuring the selection of administratively feasible and realistic fees, strengthening the institutional framework, expanding the income base, and gradually integrating the shadow sector into the mainstream of the national economy (Sharma and Kulshrestha, 2015, pp.1-2).

Thus, as an essential resource, the NTR provides an important amount of resource support for the government system to fulfil its functions. It plays a crucial role in implementing the country's social and economic strategy, encouraging the economic system reform and sustainability, optimizing infrastructure and public services, and healthy and rapid development of the national economy. Because, as economic growth theory argues, a country's rapid economic development must be based on relatively primary industries, and their development often requires a source of funds too large to be funded solely by tax revenue. NTR provide a good source for these (Zhang and Huang, 2019, p.38).

Compared to taxes, NTRs have certain advantages. They generally do not have a disincentive or substitution effect like high tax rates. They do not create the various administrative problems (especially direct taxes on incomes and wealth) that developing countries face, as in the effective management of taxes (Sharma and Kulshrestha, 2015, p.2).

The importance of NTR has increased even further as far as the income shortages and the severe financial requirements for the improvement and modernization of necessary infrastructure are concerned. For example, NTRs must finance the repairs, maintenance, and operations of existing capital assets that create positive externalities. If we detail why NTR is important, it is possible to say the following (Holmøy, 2006, p.3; Morrison, 2015, p. 54; Mohanty and Patra, 2016, pp.47-48; Zhang and Huang, 2019, pp.38-42):

• It provides higher financial opportunities for the improvement and modernization of the necessary existing infrastructure. Thus, other national resources can use to create new capital assets;

• Since tax revenues are sensitive to economic growth, they decrease substantially in cases of economic recession. Under these circumstances, NTR will help close revenue gaps;

• It contributes to the faster development of education by providing more resources to education in case of insufficient tax revenues;

• The government can compensate for the lack of a market mechanism with various fees and regulate the market;

• Various fees can be used to measure and control demand for certain types of services, apply the benefit principle, reduce negative externalities, generate monopoly profits and decrease pressure on taxes;

• The pricing mechanism can be adjusted for the demand for the provision of public goods so that it is possible to limit the demand to the socially optimal level;

• The government's user charge for some public goods and services can play a role in preventing environmental waste;

• If the government implements a user charge or fees system and strengthens its governance, it not only ensures the provision of public goods but also alleviates government fiscal pressure and helps increase the efficiency of government expenditure;

• The NTR obtained can help lower tax rates by providing flexibility to revenue from taxes under the budget balance constraint.

In addition to the advantages of NTR, there are also some disadvantages. If NTR is allowed to expand and happen unregulated, it will undoubtedly affect and prevent the central government's decision-making process and the effective control of economic stability. Expanding the NTR will unavoidably increase the burden on businesses and weaken the economic base. Increasing the non-tax burden of businesses reduces the profits of businesses, affects the income of their assets, and weakens their ability to expand the business scale. On the other hand, these funds, which cannot be used in production, are used by various government administrations, making it challenging to create investment capital. In addition, charging irregular user fees will undoubtedly increase the uncertainty of expected returns on investments and worsen the investment climate. With the continuous enlargement of government functions, the number of administrative departments established within the government would also increase. The central government has many administrative departments, and each department has its independent financial resources and interests. In addition to tax revenues, if there are many non-standard and non-regular NTR behaviors, it disrupts the functioning of the market mechanism, affects the healthy and sustainable development of the economy, misleads the behavior of enterprises and individuals, distorts production and operation activities from the direction of national industrial policy, prevents them from establishing reasonable expectations in operation, and finally difficult to implement scientific decisions (Zhang and Huang, 2019, pp.41-43).

### 1.2. Empirical literature

The existing economic literature on government revenues focuses more on tax revenues. Studies on NTR have been fewer due to the small share of these revenues in total revenues and its complexity. These few studies have focused mainly on a few specific issues, such as oil revenues, or a few countries. Studies on NTR in the relevant literature are presented below.

Taha and Loganathan (2008) conducted a study on Malaysia covering the 1970-2006 period and using the VAR model. According to the results, a bidirectional Granger causality

relationship was found between taxes (both direct and indirect) and government expenditures.

Morisson (2009) tested hypotheses on all NTR and regime stability, using a regime change theory based on the redistribution of dictatorships and democracies in different geographies. The author's conclusions show that the increase in NTR should lead to less taxation of the elite in democratic countries, more social expenditure in dictatorships, and finally, more stability for both types of regime.

Kaur (2010) analyzed government revenues in the Indian economy between 1975-2008. According to the results of the study, the central government's tax and NTR increased by 15% annually compared to the pre-reform period in 1991 and were higher than the post-reform period. The authors argue that special attention must be paid to raising taxes and NTR to cope with the fiscal crisis.

Zhao, Ma and Xiao-Li (2010) tested the impact of the Chinese government's NTR expenditures on Gross Domestic Product (GDP) between 1978-2006 with the variance decomposition method. According to the findings obtained from the study, it has been found that government purchasing expenditures have an important explanatory power on long-term economic growth. In addition, government NTR expenditures and essential investments have a limited effect on the long-term economic growth rate, while they are effective in the short term.

Mohanty and Patra (2016) focused on fifteen states in India for the period 2010-2015, examining the impact of NTR per capita on per capita revenue expenditures in the panel data method's economic services sector. The result reveals that NTR has a positive effect on the per capita revenue expenditure of subnational governments. The authors recommend that subnational governments increase NTR by applying marginal cost pricing to goods and services to increase the users' scope.

Mourre and Reut (2019) evaluated NTR in EU countries regarding size, composition, and volatility over 1995-2014. They then explore whether fiscal and macroeconomic conditions can explain countries' heterogeneity' NTR revenues using the panel data analysis. Analysis results indicate a positive and statistically significant relationship between general government expenditures, central government, local government expenditures, and NTR, and a negative and statistically significant relationship between tax revenues and NTR. Other variables have an insignificant effect and are not statistically significant.

As a consequence of the empirical literature review, it can be argued that almost no studies have examined total NTR or cover more than one country or country group. For this reason, the idea that it would be useful to perform an analysis that covers all NTR and includes a group of 28 countries, such as the EU, has inspired our study.

### 1.3. NTR by the European System of Accounts

In the presentation of the European Accounting System (ESA-2010) based government finance statistics (GFS), total government revenue; (i) total taxes; (ii) total social contributions; (iii) total sales of goods and services; (iv) other current revenue and (v) other capital revenue. In this study, the NTR is (a) total sales of goods and services; (b) other current revenue; and (c) other capital revenue. These revenues are summarized according to the ESA system (Table no. 1). Income is a transaction that increases net worth and positively impacts net lending (+) / net borrowing (-). Compulsory taxes, which are a levy on the society

in the form of taxes and social contributions, dominate government revenues. For some government levels, donations, and grants from other levels of government and international organizations are essential sources of income. Other general income categories include property income, sales of goods and services, and various transfers other than grants (ESA, 2010, p.428).

**Table no. 1. Total public revenues**

| **Total revenue** |
|---|
| = |
| **Total taxes (D.2 + D.5 + D.91)** |
| + |
| **Total social contributions (D.61)** |
| + |
| **Total sales of goods and services (P.11 +P.12 + P.131)** |
| + |
| **Other current revenue (D.39 + D.4 + D.7)** |
| + |
| **Other capital revenue (D.92 + D.99)** |

*Source: ESA, 2010, p.428.*

The sale of goods and services according to the ESA system consists of market output, output for own final use, and payments for non-market output. Other current revenue items; consist of subsidies, property income, and other current transfers. Other capital revenues include investment grants and other capital transfers (Table no. 2).

**Table no. 2. NTR by ESA System**

| **ESA resources** | **ESA GFS revenue** |
|---|---|
| P.11 Market output | Sales goods of services |
| P.12 Output for own final use | |
| P.131 Payments for non-market output | |
| D.3 Subsidies (receivable) | Other current revenue |
| D.4 Property income | |
| D.7 Other current transfers | |
| D.92r Investment grants (receivable) | Other capital revenue |
| D.99r Other capital transfers (receivable) | |

*Source: ESA, 2010, p.429.*

Several examples of NTR types can be presented. As can be seen from the examples (Table no. 3), NTR in the EU consists of various items.

**Table no. 3. Examples of NTR (simplified ESA classification)**

| Non-tax revenue item | Examples |
|---|---|
| Sales of goods and services: ESA: P11+P12+P131 | Administrative fees charged for services (licences, passports, visas, radio and television licences) |
| | Rentals of produced assets (income from rental of government buildings, road and bridge tolls, permission for use of the road infrastructure over a period of time) |
| | Fees at government hospitals and government schools |
| Current non-tax revenue: Property income, other subsidies on production and certain current transfers ESA: D4+D39+D7 | Interest from deposits, loans, debt securities; Dividends paid by public enterprises to the general government |
| | Rent income from the use or exploitation of land, sub-soil assets and other natural resources |
| | Gifts and transfers of current nature, in cash or kind, from international institutions to the general government, such as counterpart of food, military equipment, emergency aid after natural disasters |
| Capital non-tax revenue: Investment grants and certain capital transfers ESA: D92+D99 | Investment grants made by the rest of the world, including those paid by the EU institutions (for example, relevant transfers made by the European Structural and Investment Funds) |
| | Gifts and transfers of capital nature, in cash or kind, other than investment grants (for example, cases of debt cancellation) |

*Source: Mourre and Reut, 2019, p.202.*

## 2. Development of NTR in the European Union

Although the share of NTR in total revenues seems relatively small, it is critical for many countries worldwide. For example, Morrison (2015, p.5-9) states that around the world (may differ between countries), an average of 27% of national government expenditure is financed by NTR. Looking at country examples, we see that this rate is 67% in Iran, 47% in Romania, and 32% in Greece. Another point in Morrison's study, which covers the years 1973-2001, is local government revenues. Looking at NTR as a percentage of local revenues, it seems that this rate reaches severe levels, such as 91% in Mexico, 88% in France, 87% in Germany, and 61% in the United States. In summary, these figures highlight the importance of both tax and NTR for governments around the world. NTR is at least as necessary for many governments as tax revenue. The results of this study highlight the need for a comprehensive theoretical approach to understanding the political impact of such revenues.

It is useful to examine how NTRs are an essential source of financing for the EU countries in this context. The table shows the development of NTR (% GDP) in the EU (Table no. 4). According to the table, the ratio of NTR to GDP tends to decrease over the years in most EU countries. This ratio, which was 10.2% in the EU average in 1995, decreased to 7.9% in 2019.

**Table no. 4. Development of NTR in the EU (% GDP)**

| | 1995 | 2000 | 2005 | 2010 | 2015 | 2019 | % | | 1995 | 2000 | 2005 | 2010 | 2015 | 2019 | % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Belgium | 14.4 | 12.0 | 11.0 | 11.7 | 11.6 | 10.8 | -25 | Lithuania | 2.3 | 4.3 | 5.8 | 8.3 | 7.4 | 6.0 | 161 |
| Bulgaria | 11.1 | 8.0 | 6.3 | 5.3 | 7.5 | 6.1 | -45 | Luxembourg | 7.6 | 7.3 | 7.5 | 7.8 | 8.1 | 7.8 | 3 |
| Czechia | 7.2 | 6.0 | 6.3 | 7.1 | 7.4 | 6.9 | -4 | Hungary | 15.8 | 12.0 | 11.4 | 12.8 | 15.8 | 12.7 | -20 |
| Denmark | 13.0 | 10.9 | 9.2 | 9.4 | 8.6 | 7.0 | -46 | Malta | 8.8 | 10.0 | 12.2 | 9.6 | 11.3 | 10.2 | 16 |
| Germanv | 10.7 | 9.5 | 8.7 | 9.3 | 8.2 | 7.9 | -26 | Netherlands | 11.2 | 9.8 | 8.8 | 8.7 | 7.7 | 6.7 | -40 |
| Estonia | 5.7 | 5.1 | 5.5 | 7.3 | 6.5 | 5.6 | -2 | Austria | 10.9 | 9.8 | 10.4 | 9.7 | 9.1 | 8.4 | -23 |
| Ireland | 10.2 | 5.6 | 5.4 | 8.1 | 5.9 | 4.2 | -59 | Poland | 8.4 | 4.7 | 6.0 | 6.0 | 5.2 | 4.8 | -43 |
| Greece | 14.7 | 10.6 | 9.0 | 10.7 | 8.1 | 7.5 | -49 | Portugal | 8.8 | 6.7 | 6.3 | 11.0 | 12.2 | 9.5 | 8 |
| Spain | 7.6 | 6.4 | 4.7 | 5.3 | 6.0 | 5.2 | -32 | Romania | 7.3 | 7.2 | 4.1 | 8.2 | 9.8 | 6.2 | -15 |
| France | 11.2 | 10.5 | 10.7 | 11.3 | 11.5 | 11.4 | 2 | Slovenia | 5.9 | 6.5 | 6.0 | 6.3 | 6.8 | 5.4 | -8 |
| Croatia | 17.9 | 19.5 | 8.1 | 8.7 | 9.4 | 7.6 | -58 | Slovakia | 8.4 | 8.4 | 4.7 | 4.1 | 5.0 | 9.3 | 11 |
| Italy | 16.2 | 11.1 | 9.5 | 9.6 | 10.3 | 9.1 | -44 | Finland | 14.7 | 11.9 | 11.3 | 12.5 | 12.2 | 11.2 | -24 |
| S. Cyprus | 6.6 | 7.6 | 8.0 | 6.3 | 8.1 | 8.0 | 21 | Sweden | 18.4 | 12.9 | 11.3 | 10.1 | 9.0 | 8.7 | -53 |
| Latvia | 5.2 | 6.1 | 9.5 | 13.6 | 10.9 | 10.1 | 94 | UK | 6.6 | 6.3 | 7.0 | 8.7 | 7.2 | 7.2 | 9 |
| **EU average** | **10.2** | **8.8** | **8.0** | **8.8** | **8.8** | **7.9** | **-23** | | | | | | | | |

*Source: Created by the authors using data from Eurostat. 2020.*

The ratio of NTR to GDP has increased or decreased in some countries over the years, while it remained almost constant in others (Figure no. 1 and Table no. 4). For example, Latvia, which was 5.2% in 1995, reached the EU average in 2005 and increased to 9.5% and finally to 10.1% in 2019. Although this rate fluctuated slightly in France during 1995-2019, it remained almost constant. Again, in Italy, this rate decreased from 16.2% to 9.1% during the same period. However, NTRs in Italy are still above the EU average against this severe decline.

When we examined the increase and decrease of NTR in the period 1995-2019, Lithuania (160%), Latvia (94%), and Southern Cyprus (21%) showed the most significant increase, while Ireland (59%), Croatia (58%), and Sweden (53%) showed the most significant decrease. Again, the EU average of NTR decreased by 23% in the same period.

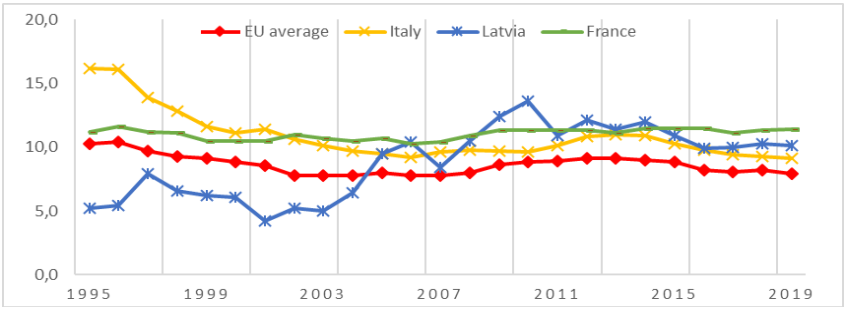



**Figure no. 1. Development of NTR in the EU (% GDP)**

*Source: Created by the authors using data from Eurostat, 2020.*

The statistics below show tax and NTR (%GDP) in total revenues relative to the EU average (Figure no. 2). Although the total revenues (%GDP) ratio increased from 42.5% to 43.1% and the ratio of tax revenues to GDP from 24.7% to 25.7% in 1995-2019, the NTR decreased from 10.2 to 7.9%. In 1995, the share of tax revenues in total revenue was 58%, while in 2019, this share increased to 60%. The share of NTR in total tax revenues decreased from 24% to 18% from 1995 to 2019. In other words, the share of NTR within the framework of the components of total revenues decreased by 33% in the relevant period. When we examine the total tax and NTR within the total revenues, we see 82% in 1995 and 78% in 2019. The remaining shares in the relevant period consist of social security premiums.

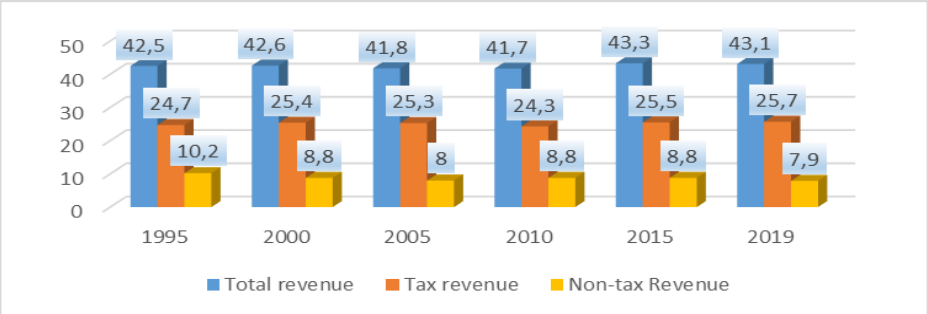



**Figure no. 2. Total revenues,, tax revenues and NTR in the EU (% GDP)**

*Source: Created by the authors using data from Eurostat, 2020*

The distribution presented below is based on the EU average for the items of NTR in the 2018 program (Figure no. 3). The three main components of NTR in 2018 were other current revenues (60%), sales of goods and services (34%), and other capital revenue (6%), respectively. From another perspective, the GDP percentage of other current revenue is 4.7%, sales of goods and services are 2.7%, and other capital revenue is 0.5%.

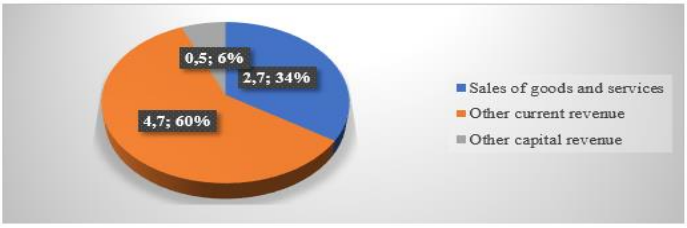



**Figure no. 3. Components of NTR in the EU (2018, % GDP)**

*Source: Created by the authors using data from Eurostat, 2020*

## 3. Empirical analysis of NTR in the European Union

### 3.1. Econometric method and data set

In this part of the study, the determinants of NTR in EU countries (except for Croatia), and the relationship between dependent-independent variables will be analyzed. As is known, it is possible to define panel data analysis as combining cross-section data of units (such as individuals, countries, firms, households) and time-series data (Baltagi, 2005). Therefore, the panel data analysis method will be used in our analysis since the variables contain both unit (EU countries) and time dimension (1995-2018 period). Then, the Granger causality test developed by Dumitrescu and Hurlin (2012) for heterogeneous panels will be used.

Firstly, descriptive statistics of the variables and regression models to be analyzed will be presented. Then cross-section dependence (CSD) tests will be applied for the variables, and unit root tests will be run according to these test results. The next step will be decided as a result of Hausman (1978) test whether fixed effects or random effects will be used in panel data analysis. In the following stage, autocorrelation, heteroscedasticity, and CSD assumptions will test for models with a fixed or random effect. If there is a problem with one or all of the relevant assumptions, it will be necessary to work with more robust models that overcome these problems. Finally, panel data analysis and panel causality test results will be presented.

The study examined data from 27 EU member states (Croatia was excluded because of a severe lack of data, and the United Kingdom was included in the study because it was a member of the Union during the period covered in the study, even though it left the EU) in the period covering 1995-2018. The data used in the study is obtained from the Eurostat (2020). The expression 'ln' in the variables means that the logarithm is used. Within the analysis scope, NTR (lnntr) are the dependent variable and are the sum of NTR defined according to ESA. Gross domestic product (lngdp) control variable and remaining variables are independent variables within different regression models' framework. The definition and sources of variables are shown below (Table no. 5).

**Table no. 5. Descriptive statistics**

| Variables | Unit | Obs. | Mean | S.Deviation | Min | Max | Data Source |
|---|---|---|---|---|---|---|---|
| Lnntr (NTR) | Million € | 648 | 9.26 | 1.81 | 4.77 | 12.51 | Eurostat |
| Lngge (General Government Expenditure) | Million € | 648 | 10.09 | 1.78 | 7.00 | 14.21 | Eurostat |
| Lntaxr (Tax Revenue) | Million € | 648 | 10.03 | 1.79 | 6.03 | 13.60 | Eurostat |
| Lngdp (Gross Domestic Product) | Million € | 648 | 11.00 | 1.70 | 7.09 | 15.00 | Eurostat |
| Lncge (Central Government Expenditure) | Million € | 648 | 10.05 | 1.70 | 6.73 | 13.84 | Eurostat |
| Lnlge (Local Government Expenditure) | Million € | 648 | 9.02 | 1.66 | 2.07 | 12.52 | Eurostat |

### 3.2. Econometric model

The main objective of the study is to analyze the determinants of NTR and how they are related. In this context, six different models will be used. It should not be surprising to see that six separate models are employed together because different variations and effects are allowed in each model. In this way, it is possible to compare the independent and control variables as the ability to explain the dependent variable. Related models are presented, respectively:

$$\ln ntr_{i,t} = \beta_0 + \beta_1 \ln gge_{i,t} + \beta_2 \ln gge_{i,t-1} + \beta_3 \ln taxr_{i,t} + \beta_4 \ln taxr_{i,t-1} + \beta_5 \ln gdp_{i,t} + \beta_6 \ln gdp_{i,t-1} + \varepsilon_{i,t} \quad (1)$$

$$\ln ntr_{i,t} = \beta_0 + \beta_1 \ln gge_{i,t} + \beta_2 \ln gge_{i,t-1} + \beta_3 \ln taxr_{i,t} + \beta_4 \ln taxr_{i,t-1} + \varepsilon_{i,t} \quad (2)$$

$$\ln ntr_{i,t} = \beta_0 + \beta_1 \ln cge_{i,t} + \beta_2 \ln cge_{i,t-1} + \beta_3 \ln taxr_{i,t} + \beta_4 \ln taxr_{i,t-1} + \beta_5 \ln gdp_{i,t} + \beta_6 \ln gdp_{i,t-1} + \varepsilon_{i,t} \quad (3)$$

$$\ln ntr_{i,t} = \beta_0 + \beta_1 \ln lge_{i,t} + \beta_2 \ln lge_{i,t-1} + \beta_3 \ln taxr_{i,t} + \beta_4 \ln taxr_{i,t-1} + \beta_5 \ln gdp_{i,t} + \beta_6 \ln gdp_{i,t-1} + \varepsilon_{i,t} \quad (4)$$

$$\ln ntr_{i,t} = \beta_0 + \beta_1 \ln lge_{i,t} + \beta_2 \ln lge_{i,t-1} + \beta_3 \ln cge_{i,t} + \beta_4 \ln cge_{i,t-1} + \beta_5 \ln taxr_{i,t} + \beta_6 \ln taxr_{i,t-1} + \beta_7 \ln gdp + \beta_8 \ln gdp_{i,t-1} + \varepsilon_{i,t} \quad (5)$$

$$\ln ntr_{i,t} = \beta_0 + \beta_1 \ln lge_{i,t} + \beta_2 \ln lge_{i,t-1} + \beta_3 \ln cge_{i,t} + \beta_4 \ln cge_{i,t-1} + \beta_5 \ln taxr_{i,t} + \beta_6 \ln taxr_{i,t-1} + \varepsilon_{i,t} \quad (6)$$

The empirical literature on NTR is scarce. The most comprehensive and up-to-date study on the subject was carried out by Mourre and Reut (2019). The authors mainly focused on tax revenues and the impact of different government expenditures (general, central, and local) on NTR. Similarly, six models that allow for different variations and effects were designed. The dependent variable in all models is NTR. Also, the models include both the values of the independent variables in year t and the values in year t-1. We followed such a path because we think lagged values of the independent variables are more effective on non-tax income. In detail, we think that tax revenues or government expenditures in year t-1 affect NTR more because given that governments' plans are based on previous period's revenues and expenditure items.

### 3.3 Diagnostic tests

In panel data analysis, some basic assumptions and conditions must be tested first. In this context, the CSD test recommended by Pesaran (2004) was applied based on variables. We used the Pesaran (CD) test because it is N> T; that is, the study covers 27 countries and 24 years. In addition, the CSD test result is also significant in terms of unit root test. If there

is CSD, first-generation unit root tests are not used. Therefore, the second-generation unit root tests that consider the CSD should be used. CD test for variables is presented below (Table no. 6).

**Table no. 6. Cross section dependence test for variables**

| Method | Variables | | | | | |
|---|---|---|---|---|---|---|
| | lnntr | lngge | lntaxr | lngdp | lncge | lnlge |
| CD Test | 75.41 (0.000) | 86.43 (0.000) | 87.26 (0.000) | 87.03 (0.000) | 84.35 (0.000) | 72.61 (0.000) |

*Note: Results in parentheses reflect p-values*

According to the results (Table no. 6), there is CSD in all variables. Therefore, it should be preferred with the second-generation unit root tests. The unit root test (CIPS), developed by Pesaran (2007) and taking into account the CSD, was carried out (Table no. 7). According to the results, it is observed that the variables are stationary (I0) in both constant and constant with trend models (Table no. 7). In other words, it can be said that there is no unit root in the variables, and there is no drawback in the analysis for now.

**Table no. 7. Unit root test for variables**

| Variables | Pesaran CIPS Test | |
|---|---|---|
| | Constant | Constant with Trend |
| Lnntr | -2.374** | -2.611* |
| Lngge | -3.158*** | -3.696*** |
| Lntaxr | -2.145* | -2.661* |
| Lngdp | -2.111* | -3.057*** |
| Lncge | -3.276*** | -3.689*** |
| Lnlge | -2.607*** | -3.065*** |

*Note: The expressions *, **, *** mean that the variables are stationary at the level of 10%, 5%, and 1%, respectively. Critical values for the CIPS constant statistic are 10% = -2.07% 5 = -2.15% 1 = -2.3. CIPS is the critical values of statistics for constant with trend %10=-2.58 %5=-2.66 %1=-2.81*

Another diagnostic test in panel data models is about whether fixed or random estimators should be used. The Hausman (1978) test is often used to choose among estimators in the econometric literature. The Hausman test results are as follows (Table no. 8).

**Table no. 8. Hausman tests**

| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 |
|---|---|---|---|---|---|---|
| Hausman Test | 5.57 (0.4726) | 2.65 (0.6177) | 28.31 (0.0001) | 10.37 (0.1101) | 29.30 (0.0003) | 25.55 (0.0003) |
| Estimator Decision | RE | RE | FE | RE | FE | FE |

*Note: Results in parentheses reflect p-values*

According to the test results, the fixed effects estimator will be used since the chi-square p-values calculated for the third, fifth, and sixth models are less than 0.05 (Table no. 8). In other models, the random effects estimator will be used, since the calculated chi-square p-values are greater than 0.05. After determining the estimators of fixed and random effects, an autocorrelation test should be performed. In both estimators, Baltagi and Wu (1999) are LBI

test, and Bhargava, Franzini, and Narendranathan (1982) are DW test can be applied. Autocorrelation test results are presented below (Table no. 9).

**Table no. 9. Autocorrelation tests**

| Method | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 |
|---|---|---|---|---|---|---|
| Bhargava et al. DW Test | 0.47 | 0.46 | 0.49 | 0.51 | 0.50 | 0.48 |
| Baltagi-Wu LBİ Test | 0.64 | 0.64 | 0.65 | 0.69 | 0.66 | 0.65 |

*Note: Results are values corresponding to test statistics for both methods*

According to the test results, autocorrelation is available in all models since the test statistics results of both methods are less than 2 in all models (Table no. 9). Therefore, the absence of autocorrelation, which is one of the assumptions of panel data analysis, cannot be met. Another assumption is that there is no heteroscedasticity. Different tests are applied for fixed and random effects estimators to test heteroscedasticity. Levene (1960) and Brown and Forsythe (1974) used for random effects estimators and modified Wald tests for fixed effects. Heteroscedasticity test results are presented below (Table no. 10).

**Table no. 10. Heteroscedasticity tests**

| | Levene (1960); Brown and Forsythe (1974) Test | Modified Wald Test |
|---|---|---|
| Model 1 (RE) | W0=14.6650783 Pr >0.00000000<br>W50=8.4760949 Pr >0.00000000<br>W10=13.6466596 Pr >0.00000000 | |
| Model 2 (RE) | W0=14.3969928 Pr >0.00000000<br>W50=8.4353093 Pr >0.00000000<br>W10=13.2823083 Pr >0.00000000 | |
| Model 3 (FE) | | 3936.25<br>(0.0000) |
| Model 4 (RE) | W0=13.0519645 Pr >0.00000000<br>W50=7.3597185 Pr >0.00000000<br>W10=12.0476020 Pr >0.00000000 | |
| Model 5 (FE) | | 4052.23<br>(0.0000) |
| Model 6 (FE) | | 4238.59<br>(0.0000) |

*Note: The degrees of freedom for the first test is (26, 594)*
*while for the modified Wald test it is 27 degrees of freedom*

The test results imply the existence of heteroscedasticity since the p-values of the W0, W50 and W10 test statistics calculated for random effects models are less than 0.05 (Table no. 10). A similar result is also valid for fixed-effect models. In summary, for all models (both constant and random effects), there is heteroscedasticity. Therefore, autocorrelation, as the well as heteroscedasticity problem, exists in all models. Finally, although we test the CSD based on variables, we find it useful to test the CSD based on the model. The test recommended by Pesaran (2004) applied for the CD test, and the results are presented below (Table no. 11).

**Table no. 11. Cross section dependence test for models**

| Method | Models | | | | | |
|---|---|---|---|---|---|---|
| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 |
| Pesaran (2004) CD Test | 8.170 (0.0000) | 8.510 (0.0000) | 5.680 (0.0000) | 14.436 (0.0000) | 5.228 (0.0000) | 4.391 (0.0000) |

*Note: Results in parentheses reflect p-values*

Considering the test results, since the p-values corresponding to the CD statistic are less than 0.05, there is a CSD in all models (Table no. 11). In all models, autocorrelation and heteroscedasticity, and the presence of CSD, have led to biased and ineffective results (such as deviation in standard errors, biased results t-statistical values, and confidence intervals) in standard panel data analysis. Therefore, Driscoll and Kraay (1998) estimator, which overcomes these problems and produces robust standard errors, is used. Besides, another reason why we prefer this model is that it is suitable for the data set used in our study, that is, N> T, and other robust models mostly give T> N more effective results. Finally, although this model is for previously pooled least squares and fixed effects estimators, it has recently become applicable to random effects. The results of the robust estimator are presented for the six designed models (Table no. 12).

**Table no. 12. Analysis results**

| Dependent variable: lnntr | Model 1 (RE) | Model 2 (RE) | Model 3 (FE) | Model 4 (RE) | Model 5 (FE) | Model 6 (FE) |
|---|---|---|---|---|---|---|
| lngge | 0.41** (2.37) | 0.34** (2.52) | | | | |
| L1. lngge | 0.56*** (4.09) | 0.69*** (4.37) | | | | |
| lntaxr | 0.05** (-2.64) | 0.28** (2.53) | 0.04** (3.07) | 0.72** (3.58) | 0.48** (3.59) | 0.28* (2.04) |
| L1.lntaxr | -0.50** (-2.64) | -0.31*** (-3.79) | -0.59** (-3.31) | -0.43* (-2.05) | -0.58** (-3.44) | -0.21 (-2.67) |
| lncge | | | 0.33** (2.94) | | 0.36** (3.36) | 0.39*** (3.97) |
| L1.lncge | | | 0.46*** (4.11) | | 0.44** (3.61) | 0.54*** (4.81) |
| lnlge | | | | -0.17 (-1.44) | -0.11 (-1.19) | -0.01 (-1.52) |
| L1.lnlge | | | | 0.14 (1.10) | 0.07 (0.77) | 0.13 (1.16) |
| lngdp | -0.45 (-1.41) | | -0.40 (-1.28) | | -0.32 (-1.12) | |
| L1.lngdp | 0.50 (1.59) | | 0.72** (2.08) | | 0.67** (2.35) | |
| Constant | -1.72*** (-6.27) | -1.71*** (-4.92) | -1.00*** (-3.84) | -2.05*** (-3.86) | -1.78** (-3.57) | -1.32** (-2.67) |
| $R^2$ | 0.98 | 0.98 | 0.86 | 0.97 | 0.86 | 0.86 |
| Number of Countries | 27 | 27 | 27 | 27 | 27 | 27 |
| Number of Observations | 621 | 621 | 621 | 621 | 621 | 621 |

*Note: Values in parentheses show t-statistics values. The expressions *, ** and *** indicate significance at the 10%, 5%, and 1% levels, respectively.*

The $R^2$ values for all models are relatively high, and the models' explanatory power is strong (Table no. 12). When we examine it based on variables, lngge, and the lagged value (general government expenditure) have a statistically significant and robust positive impact in two

models. In other words, as the general government expenditures increase, NTR are used more, and thus, NTR increase. The tax revenue variable (lntaxr) has a statistically significant impact on almost all models, but its lagged values negatively impact in accordance with our expectations. The expectation of such a result seems meaningful considering that the tax revenues in t-1 impact on NTR more because the governments made plans based on the revenues and expenditure items of the previous period. Another variable, lngdp (gross domestic product), has a statistically insignificant effect in all models, while its lagged values have a statistically significant and robust positive impact in two models. Therefore, an increase in the lagged value of the GDP increases the current period NTR. Central government expenditure (lncge), has a statistically significant and robust positive impact in all models, similar to general government expenditure (lngge). Given that central government expenditure accounts for a large part of general government expenditure, the existence of such a similar effect makes sense. Finally, local government expenditure (lnlge) is statistically insignificant in any model.

In addition to the analysis results for fixed and random effects, it will be beneficial to analyze the causality relationships between the dependent and independent variables. In this way, unidirectional or bidirectional relationships between variables will be determined, and the strength of the existing evidence will increase. Also, unlike fixed and random effects models, country-specific results can be observed in panel causality tests. In this context, a total of ten causality tests were performed between dependent and independent variables. In causality tests, first, CSD and unit root tests should be run. But they will not be repeated, since the relevant tests were conducted at the previous analysis stage. Firstly, VAR analysis was performed, and, accordingly, the appropriate lag length was determined for the causality test. The optimum lag length was selected as 1 in all tests according to information criteria. Before passing the panel causality tests, the delta test developed by Pesaran and Yamagata (2008) was used to determine whether the country-specific factors were the same or different from each other. Results for the delta test are presented below (Table no. 13).

**Table no. 13. Panel homogeneity tests (Delta tests)**

| Variable | Delta Test | P-value | Variable | Delta Test | P-value |
|---|---|---|---|---|---|
| lnntr-lngge | Δ=29.488<br>Δadj=31.524 | 0.000<br>0.000 | lngge-lnntr | Δ=22.459<br>Δadj=24.009 | 0.000<br>0.000 |
| lnntr-lntaxr | Δ=27.906<br>Δadj=29.883 | 0.000<br>0.000 | lntaxr-lnntr | Δ=17.786<br>Δadj=19.014 | 0.000<br>0.000 |
| lnntr-lngdp | Δ=29.199<br>Δadj=31.215 | 0.000<br>0.000 | lngdp-lnntr | Δ=16.432<br>Δadj=17.566 | 0.000<br>0.000 |
| lnntr-lncge | Δ=27.888<br>Δadj=29.813 | 0.000<br>0.000 | lncge-lnntr | Δ=21.346<br>Δadj=22.820 | 0.000<br>0.000 |
| lnntr-lnlge | Δ=29.433<br>Δadj=31.465 | 0.000<br>0.000 | lnlge-lnntr | Δ=24.526<br>Δadj=26.219 | 0.000<br>0.000 |

Delta test is conducted for ten different causality tests as viewed in above (Table no. 13). Because the p-value corresponding to the test statistics is less than 0.05, it is concluded that the slope coefficients of all the variables in the equations are heterogeneous. Since the slope coefficients are heterogeneous, the Dumitrescu and Hurlin (2012) panel causality test is applied, and the results are presented below (Table no. 14).

**Table no. 14. Panel causality results**

| Variable | Tests | Statistics | P-value | Variable | Tests | Statistics | P-value |
|---|---|---|---|---|---|---|---|
| lnntr-lngge | Z-bar | 165.272 | 0.0000 | lngge-lnntr | Z-bar | 68.359 | 0.0000 |
| | Z-bar tilde | 133.126 | 0.0000 | | Z-bar tilde | 53.086 | 0.0000 |
| lnntr-lntaxr | Z-bar | 105.257 | 0.0000 | lntaxr-lnntr | Z-bar | 35.061 | 0.0005 |
| | Z-bar tilde | 83.560 | 0.0000 | | Z-bar tilde | 25.585 | 0.0105 |
| lnntr-lngdp | Z-bar | 157.255 | 0.0000 | lnntr-lngdp | Z-bar | 26.647 | 0.0077 |
| | Z-bar tilde | 126.504 | 0.0000 | | Z-bar tilde | 18.836 | 0.0624 |
| lnntr-lncge | Z-bar | 142.576 | 0.0000 | lncge-lnntr | Z-bar | 97.543 | 0.0000 |
| | Z-bar tilde | 114.381 | 0.0000 | | Z-bar tilde | 77.189 | 0.0000 |
| lnntr-lnlge | Z-bar | 136.541 | 0.0000 | lnlge-lnntr | Z-bar | 78.361 | 0.0000 |
| | Z-bar tilde | 109.397 | 0.0000 | | Z-bar tilde | 61.346 | 0.0000 |

*Note: H0 hypothesis is not granger cause, H1 is established as granger causality in at least unit.*

According to the results, the causality relationship in at least one unit in nine equations is accepted (Table no. 14). There is no causal relationship only from lnntr to lngdp. Although the z-bar, which is one of the related causality results, was significant, the Z-bar tilde was found to be insignificant. Because, considering the unit and time dimension of our study, the test results in the Z-bar tilde were taken as the basis, and it was concluded that there was no causality. In general, the unidirectional causality relationship was determined in at least one unit of all explanatory variables to the dependent variable lnntr. Again, from the dependent variable lnntr to the independent variables (except lngdp), a unidirectional causality relationship was found at least in the unit. When we examine the unidirectional causality relationship from independent variables to dependent variable lnntr on a country basis, the results are as follows (Table no. 15).

**Table no. 15. Unidirectional causality results from independent variables to dependent variable**

| **lnntr ← lngge** |
|---|
| BE BG CZ IE ES FR LU PT RO |
| **lnntr ← lntaxr** |
| BE BG CZ CY AT RO |
| **lnntr ← lngdp** |
| BE BG CZ DE EE FR CY MT AT PT RO |
| **lnntr ← lncge** |
| BE BG CZ DK IE ES LU HU AT PT RO |
| **lnntr ← lnlge** |
| BE BG CZ DE EE IE EL ES LU PL PT RO SI FI |

According to the results, it can be observed that there is a causality from all independent variables to the dependent variable lnntr (Table no. 15). The most interesting in the results is that while the lnlge (local government expenditure) variable is statistically insignificant in any model in the static analysis, an effect in terms of causality relationship is determined. Countries with this relationship are (lnlge to lnntr) Finland, Bulgaria, Romania, Portugal, Poland, Luxembourg, Belgium, Denmark, Slovenia, Estonia, Germany, Greece, Czech Republic, Ireland, and Spain. In other variables, there was a statistically significant impact on lnntr (NTR) in the static analysis. However, in terms of causality, these variables have also been found to be related in some countries, but not others. For example, countries with

unidirectional causality from Ingge (general government expenditure) to the dependent variable Inttr are Belgium, Bulgaria, the Czech Republic, Ireland, Spain, France, Luxembourg, Portugal, and Romania. Unidirectional causality relationship from tax revenues (lntaxr) to the dependent variable lnntr found in Belgium, Bulgaria, Czech Republic, Southern Cyprus, Austria, and Romania. The unidirectional causality relationship from central government expenditure (lncge) to lnntr exists in Romania, Portugal, Austria, Hungary, Luxembourg, Ireland, Spain, Denmark, Czech Republic, Bulgaria, and Belgium. Finally, in the unidirectional causality test from lngdp (gross domestic product) variable to lnntr, the relationship is determined for Romania, Portugal, Austria, Malta, Southern Cyprus, France, Spain, Denmark, Czech Republic, Bulgaria, and Belgium. Apart from these countries, no causality relationship could be found for the United Kingdom, Sweden, Slovakia, Lithuania, Latvia, and Italy. Both the existence of bidirectional causality and causality statistics can be seen below (Table no. 16).

**Table no. 16. Causality results by country**

| NTR ↑ GGE | Coef | GGE ↑ NTR | Coef | NTR ↑ TAXR | Coef | TAXR ↑ NTR | Coef | NTR ↑ LGE | Coef | LGE ↑ NTR | Coef | NTR ↑ CGE | Coef | CGE ↑ NTR | Coef | NTR ↑ GDP | Coef | GDP ↑ NTR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BE • | 0.34 (4.12) | BE • | -0.27 (-2.34) | BE | 0.21 (3.10) | BG • | -0.20 (-2.26) | BE | 0.22 (4.00) | IE • | -2.87 (-2.81) | BE | 0.36 (3.25) | BG • | -0.40 (-3.61) | BE | 0.24 (3.62) | None |
| BG • | 0.57 (3.86) | BG • | -0.33 (-3.37) | BG • | 0.51 (4.48) | LU | 0.38 (2.47) | BG | 0.67 (4.08) | NL | 1.08 (4.70) | BG • | 0.50 (3.75) | DE | 0.91 (3.17) | BG | 0.64 (4.72) | |
| CZ | 0.54 (3.66) | ES | -0.27 (-3.31) | CZ | 0.06 (3.53) | MT | 0.38 (3.10) | CZ | 0.32 (2.23) | AT | 0.42 (3.13) | CZ | 0.42 (2.81) | FR | 0.53 (2.68) | CZ | 0.55 (3.22) | |
| IE | 0.18 (4.02) | NL | 0.44 (2.85) | DE | 0.18 (2.87) | NL | -0.36 (-2.86) | DE | 0.24 (2.79) | RO • | -0.27 (-2.56) | DK | 0.17 (2.48) | NL | 0.06 (2.84) | DE | 0.20 (3.03) | |
| ES | 0.19 (3.19) | PT • | -0.01 (-2.13) | CY | 0.62 (2.54) | RO • | -0.26 (-2.67) | EE | 0.48 (2.75) | FI • | -0.31 (-2.13) | IE | 0.18 (4.04) | RO • | -0.25 (-3.17) | ET | 0.40 (2.41) | |
| FR | 0.87 (3.65) | RO • | -0.26 (-3.03) | AT | 0.31 (2.10) | | | IE • | 0.09 (3.26) | | | ES | 0.31 (3.97) | FI | 0.55 (4.11) | FR | 0.04 (3.29) | |
| LU | 0.44 (2.90) | | | RO • | 0.71 (3.23) | | | EL | 0.29 (2.29) | | | LU | 0.42 (2.70) | SE | -0.39 (-2.61) | CY | 0.79 (2.87) | |
| PT • | 0.04 (2.91) | | | | | | | ES | 0.10 (2.39) | | | HU | 0.03 (2.27) | | | MT | 0.51 (2.13) | |
| RO • | 0.66 (3.08) | | | | | | | LU | 0.29 (2.38) | | | AT | 0.47 (2.54) | | | AT | 0.57 (3.22) | |
| | | | | | | | | PL | 0.24 (2.18) | | | PT | 0.39 (2.90) | | | PT | 0.31 (2.09) | |
| | | | | | | | | PT | 0.25 (2.80) | | | RO • | 0.59 (3.04) | | | RO | 0.61 (2.99) | |
| | | | | | | | | RO • | 0.32 (2.77) | | | | | | | | | |
| | | | | | | | | SI | 0.30 (2.27) | | | | | | | | | |
| | | | | | | | | FI • | 0.25 (2.41) | | | | | | | | | |

The "•" sign in the results indicates bidirectional causality (Table no. 16). Bidirectional causality relationship between NTR and GGE is found in Belgium, Bulgaria, Portugal, and Romania. Also, countries with bidirectional causality between NTR and TAXR are only Bulgaria and Romania. The relationship of bidirectional causality between NTR and LGE can be observed in Ireland, Romania, and Finland. Looking at the countries with bidirectional causality between NTR and CGE, we found similarity in Bulgaria and Romania. There is no bidirectional causality between NTR and GDP in any country.

## Conclusion

Although tax revenues have a significant share to meet increasing government expenditures today, the need for alternative revenue sources is increasing day by day. When these alternative sources of revenue are considered, NTRs are quite remarkable. Therefore, our study aims to present the theoretical and empirical analysis of NTR in the EU.

When the EU is examined, NTR tend to increase in some countries and decrease in others. However, we can say that the number of countries with an increase in NTR is very low compared to the number of countries showing a decrease in NTR. Also, this situation is observed when the EU average is examined. In other words, the ratio of NTR to GDP, based on the EU average, was 10.2% in 1995 but decreased to 7.9% in 2019.

In the empirical part of the study, the determinants of NTR for the EU countries (except for Croatia) for 1995-2018 and the relationship between them are analyzed by using panel data analysis and panel causality methods. According to the findings, general government expenditures and central government expenditures and their lagged values have a statistically significant and positive effect on NTR. While tax revenues have a statistically significant and positive impact on NTR, the lagged value of tax revenues has a statistically significant and negative impact on NTR. On the other hand, the only lagged value of GDP has a statistically significant and positive effect on NTR. In contrast, local government expenditures have a statistically insignificant impact on NTR. According to these results, as the general government expenditures, central government expenditures, tax revenues, and the lagged value of GDP increase, NTR also increase. However, as the lagged value of tax revenues increases, NTR decrease. According to another analysis that tests the causality relationships between dependent and independent variables, a causality relationship is observed from all independent variables to NTR is observed. Besides, a unidirectional causality relationship from NTR to all independent variables (except for GDP) is determined. Therefore, we can say that there is a bidirectional causality relationship between NTR and independent variables, except GDP.

As a result, we can say that most revenue in EU countries consists of taxes, and NTRs are neglected. However, considering that the ratio of NTR to total revenues is approximately one-fifth and constitutes approximately 8% of GDP today, we underline that these amounts should not be neglected. Although the heterogeneous structure of NTR makes it difficult to study this issue, more academic studies on the subject would both make an important contribution to the relevant literature and provide policymakers with more data to develop more sound and effective policies.

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**Annex no.1. Country abbreviations**

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|---|---|---|---|---|---|---|---|
| Belgium | (BE) | Greece | (EL) | Lithuania | (LT) | Portugal | (PT) |
| Bulgaria | (BG) | Spain | (ES) | Luxembourg | (LU) | Romania | (RO) |
| Czechia | (CZ) | France | (FR) | Hungary | (HU) | Slovenia | (SI) |
| Denmark | (DK) | Croatia | (HR) | Malta | (MT) | Slovakia | (SK) |
| Germany | (DE) | Italy | (IT) | Netherlands | (NL) | Finland | (FI) |
| Estonia | (EE) | Cyprus | (CY) | Austria | (AT) | Sweden | (SE) |
| Ireland | (IE) | Latvia | (LV) | Poland | (PL) | United Kingdom | (UK) |