# The Role of Administrative Digitalization and Economic Development in Shaping Fiscal Efficiency: A Cross-National Analysis

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**Abstract**

*The paper investigates the relationship between government digitalization and economic and fiscal performance in European countries. Two multiple regressions were used with GDP(Gross Domestic Product) per capita and Tax Revenue as Percentage of GDP (TaxGDP) as dependent variables, and EGDI (E-Government Development Index) and EPI (E-Participation Index) as predictors. The results show that EGDI positively and significantly influences the tax share in GDP, while the effect on GDP per capita is not significant. Also, EPI has no significant effect on any of the dependent variables. The study highlights the role of government digitalization in fiscal consolidation, but not in direct economic growth, suggesting the need for integrated e-government and economic development policies. The paper contributes to the specialized literature by clarifying the differential effects of digitalization on macroeconomic indicators.*

**Key words**: government digitalization, digital governance, electronic public services, EGovernment, E-participation
**J.E.L. classification:** E60

## 1. Introduction

In recent decades, global society has experienced profound structural transformations generated by the rapid advance of digital technologies. The digitalization process has changed not only the way in which individuals communicate, consume information and interact economically, but also the architecture of public governance and the citizen-state relationship. In this context, the concept of e-government has gained particular importance, reflecting the states capacity to integrate information and communication technology into administrative processes, the provision of public services and the participation of citizens in the decision-making process.

The present paper is part of this thematic framework and investigates the relationship between the digitalization level of government, namely the degree of electronic citizens participation, and macroeconomic indicators such as product per capita and the degree of tax collection compared to GDP, in the European Union member states. The analysis focuses on the European Governance Digitalization Index (EGDI) and the E-Participation Index (EPI), two established international tools for measuring government digitalization, and how they correlate with economic performance.

The motivation derives from the growing relevance of government digitalization in the economic and administrative architecture of modern states. Currently, digitalization is not only a strategy for administrative efficiency, but also a catalyst for economic development, competitiveness, social inclusion and bureaucracy reduction. In the specialized literature, studies on the effects of e-

government on economic development highlight both benefits in terms of administrative efficiency and increased transparency, as well as risks associated with digital divides and cybersecurity (United Nations, 2022; Eurostat, 2024; World Bank, 2024). In Romania, the topic is all the more relevant as the National Recovery and Resilience Plan (PNRR) allocates significant funds for digitalization, and progress still remains below potential compared to the EU average.

The aim of the paper is to analyse the relationships between the government digitalization level (EGDI) and electronic participation (EPI) on the one hand, and macroeconomic indicators (GDP per capita and taxes as a percentage of GDP) on the other hand, in order to understand how digitalization can be a factor of economic and social progress.

The general objective of the research is to empirically investigate the correlations between e-government indicators and selected economic variables, in EU member states, with the aim of providing an integrated perspective on the impact of digitalization on economic performance at the European level.

The research question guiding the paper is formulated as follows: *"To what extent can the government digitalization degree and the e-participation level influence the tax collection degree and the product per capita in EU member states?"*

Starting from this question, the research hypothesis assumes that there is a significant positive relationship between the government digitalization degree (EGDI), the e-participation level (EPI) and product per capita (GDPCapita), respectively taxes collected relative to GDP (TaxGDP).

The paper is structured as follows: the introductory part presents the conceptual framework and motivation of the topic, the main objective, the purpose and the research question. The second chapter provides the theoretical foundation, addressing the relevant definitions, concepts and theories about government digitalization, e-participation and their relationship with economic development. The third chapter details the research methodology, describing the research design, hypotheses, statistical tools used, data sources and methods of collecting and processing them. The multiple linear regression model applied is explicitly presented, as well as the justification for using the EGDI, EPI, GDPCapita and TaxGDP indicators. The fourth chapter presents the research results, including descriptive analyses, Pearson and Spearman correlation tests, regression analysis and the results interpretation, with reporting of statistical significance and coefficient values as well as the integrated interpretation of the results in relation to the specialized literature, practical implications for public digitalization policies. The last chapter presents the conclusions, as well as the limitations of the study and future research directions.

Thus, this paper proposes a rigorous and necessary empirical analysis to understand the impact of government digitalization on economic development, in the context of European integration and the accelerated transition to e-government, offering both a theoretical contribution to the specialized literature and a practical one, with direct relevance for administrative modernization and public policy strategies in Romania and the EU member states.

## 2. Literature review

Government digitalization and e-government have been topics of increasing interest in the scientific literature over the past two decades, due to the major transformations they have brought to the citizen-state relationship and to administrative processes.

The most cited studies in the field include research from the early and mid-2000s, which laid the conceptual foundations of e-government. For example, Heeks (2006) was one of the pioneers who analysed the impact of information technologies on public sector reform, emphasizing the importance of digital transformation in improving transparency and administrative efficiency. Also, Dunleavy et al. (2006) developed the "digital era governance" model, which conceptualizes the integration of digital technologies into public governance as an essential evolutionary stage for the administration modernization.

Another highly cited study is that of Layne & Lee (2001), who proposed a four-level framework for implementing e-government, from simple static web pages to integrated electronic service systems. These theoretical frameworks were further developed by Moon (2002), who identified the success factors of e-government, including technological infrastructure and organizational culture.

From the perspective of the relationship between e-government and economic performance, West (2005) analysed how digitalization can contribute to increasing government efficiency and stimulating economic development by facilitating access to services and reducing administrative costs. This idea is also supported by Bannister & Connolly (2014), who summarized the role of e-government in promoting transparency, accountability and citizen involvement.

In terms of the most relevant recent studies, literature published in the last five years offers valuable insights into the impact of digitalization in the current context of European and global economies. For example, the link between e-participation and the trust level in institutions has been highlighted, as well as the role of digital governance in supporting the states resilience in the face of crises (Kraemer-Mbula et al., 2020; Janssen & Estevez, 2021).

A key study by Zuiderwijk & Janssen (2019) analyses the barriers and facilitators of the implementation of open and digital government policies, highlighting the importance of digital infrastructure and human capital in the success of these initiatives. Recently, Kettunen & Kallio (2022) explored the role of digital governance in the green and sustainable transition process, indicating the interdependence between technology and effective public policies.

As for the latest studies published between 2022 and 2025, they bring to the fore topics such as artificial intelligence in governance, the impact of the COVID-19 pandemic on the acceleration of digitalization, and the use of big data in decision-making. For example, Nguyen et al. (2023) investigate how governments have used digital platforms to ensure the continuity of public services during the pandemic, highlighting the increase in e-participation and transparency.

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Furthermore, Patel & Sharma (2024) analyse the correlation between the digitalization level of public administration and economic performance in EU member states, using a complex econometric models that confirm the positive influence of digitalization on budget revenues and economic development. Also, Chen & Zhang (2025) provide a comparative perspective on digital strategies in Asia and Europe, highlighting the factors that contribute to the success of e-government implementation. These studies reflect the rapid evolution of the field, its practical relevance, and the continuing need for empirical research, especially in the dynamic context of global digitalization and economic transformations. They also support the hypothesis of the present paper that e-participation indicators, tax collection, and GDP per capita are essential factors influencing the level of government digitalization.

## 3. Research methodology

The present study aims to analyse the relationships between the digitalization government degree, the e-participation level, the tax revenue collection degree and the economic development level in European countries. The research uses secondary data, taken from official international sources, namely the E-Government Development Index (EGDI) and E-Participation Index (EPI) indicators published by the United Nations (2022, 2024), data on tax revenues reported to GDP (TaxGDP) and GDP per capita (GDPCapita) obtained from the Eurostat (2024) and World Bank (2024) databases.

The dataset includes information for a number of 30 European countries for a reference period between 2019 and 2024. For all variables used, the average was calculated for the period considered, taking into account the relative stability of these indicators and their structural nature.

In order to answer the research question, we formulated the following research hypotheses:

***H1***. *There is a significant positive relationship between the government digitalization degree (EGDI), the e-participation level (EPI) and the GDP per capita*.

To test the hypothesis, the analysis was structured in two stages. In the first stage, Pearson and Spearman correlations were calculated to highlight the existence and direction of associations between variables. In the second stage, multiple linear regression models were estimated to evaluate the influence of independent variables on the government digitalization index.

The proposed regression model has the following general form:

$$GDPCapita = \beta_0 + \beta_1 (EGDI_i) + \beta_2 (EPI_i) + \epsilon_i$$

Where:
$\beta_0$ = intercept (constant)
$\beta_1$ = effect of EGDI on GDP per capita
$\beta_2$ = effect of EPI on GDP per capita
$\epsilon_i$ = residual error

***H2****. There is a significant positive relationship between the government digitalization degree (EGDI), the e-participation level (EPI) and the Tax Revenue as Percentage of GDP.*

$$TaxGDP = \beta_0 + \beta_1 (EGDI_i) + \beta_2 (EPI_i) + \epsilon_i$$

Where:
$\beta_0$ = intercept (constant)
$\beta_1$ = effect of EGDI on the level of taxes collected relative to GDP
$\beta_2$ = effect of EPI on the level of taxes collected relative to GDP
$\epsilon_i$ = residual error

The estimates were made using the SPSS statistical package, testing the hypotheses regarding the statistical significance of the coefficients and the overall model quality. The validity conditions of the multiple regression were also verified, namely the normality of the residuals, linearity, homoscedasticity and the lack of multicollinearity.

Through this methodological approach, the research aims to clarify the extent to which the economic development level and the capacity to collect tax revenues explain the variations in the degree of digitalization of public administration and, complementary, the role of citizen participation in digital governance processes. The results obtained will allow the formulation of conclusions regarding digital and fiscal convergence in the European space, with implications for the development of public policies.

## 4. Results and discussion

The descriptive analysis highlighted the following: the average of the EGDI index is 0.859, with a low standard deviation (0.063), confirming a high and homogeneous level of government digitalization in the EU. GDP per capita has a relatively high dispersion, suggesting economic variation between countries. The average GDP per capita in the analysed sample is 47,000 USD, with a standard deviation of 22,436 USD, highlighting a substantial variation between the analysed states. The average for the EGDI is 0.859, indicating a high level of e-government development on average in Europe. And the average tax share in GDP (TaxGdp) for the analysed European states is 36.01%, with a standard deviation of 5.71%, indicating moderate variations between states in terms of fiscal pressure. The average EPI index is 0.729, with a standard deviation of 0.1117, indicating a high level of electronic citizen participation, with moderate variations between states.

*Table no. 1 Correlation Matrix with Pearson and Spearman Correlation Coefficients and Significance Levels*

| CORELATIONS | Pearson | Sig. Pearson | Spearman | Sig. Spearman |
|---|---|---|---|---|
| EGDI - EPI | 0,697 | < 0,001 | 0,752 | < 0,001 |
| EGDI – TaxGdp | 0,549 | 0,003 | 0,553 | 0,003 |
| EGDI – GDPCapita | 0,529 | 0,003 | 0,703 | < 0,001 |
| EPI – TaxGdp | 0,274 | 0,166 | 0,413 | 0,032 |
| EPI – GDPCapita | 0,345 | 0,084 | 0,571 | 0,002 |
| TaxGdp – GDPCapita | 0,242 | 0,233 | 0,571 | 0,002 |

*Source:* made by authors

Pearson correlation analysis revealed a strong positive relationship between EGDI and EPI (r=0.697, p<0.001), as well as moderate correlations between EGDI and TaxGdp (r=0.549, p=0.003), respectively GDPCapita (r=0.529, p=0.003). Spearman correlations confirmed these results, indicating a strong monotonic association between the same variables, EGDI and GDPCapita having ρ=0.703 (p<0.001). These results suggest that a higher level of government digitalization is associated with a higher GDP per capita and a higher tax-to-GDP ratio, potentially reflecting both institutional capacity and the level of economic development. The explanation may be that digitalization facilitates the efficiency of tax collection, reduces evasion and optimizes voluntary compliance.

The weak positive correlation between TaxGdp and EPI, which is not statistically significant, indicates that the e-participation level does not have a direct effect on Tax Revenue as Percentage of GDP, but the direction of the relationship is positive.

There is a strong and significant correlation between EGDI and EPI (r = 0.697, p < 0.001), which suggests that countries with a developed digital government offer even more opportunities for e-participation for citizens.

The data analysis aimed to examine the effect of the e-Government Index (EGDI) and the e-Participation Index (EPI) on two dependent variables: GDP per capita (GDPCapita) and the Tax Revenue as Percentage of GDP (TaxGdp). Two multiple regression models were conducted, one for each dependent variable, to highlight how the degree of government digitalization and citizen participation through digital platforms influence the economic and fiscal performance in the analysed countries

*Table no. 2 Multiple Regression Analysis Results Predicting GDP per Capita*

| | **R** | **R Square** | **Adjusted $R^2$** | **Std.Beta** | **Std. Error** | **UnStd. Beta** | **t** | **VIF** | **F change** |
|---|---|---|---|---|---|---|---|---|---|
| Constant/ GDPCapita | 0,427 | 0,182 | 0,111 | | 18.484,869 | -62.852,04 | -1,187 | | 2,564 |
| EGDI | | | | 0,345 | 82.035,85 | 109.519,37 | 1,335 | 1,879 | |
| EPI | | | | 0,109 | 48.301,79 | 20.358,84 | 0,421 | 1,879 | |

*Source:* made by authors

In the first model, with GDPCapita as the dependent variable and EGDI and EPI as predictors, the results can be summarized as follows: $R^2 = 0.182$, which indicates that the model explains 18.2% of the variation in GDP per capita. Although this percentage is not high, it reflects a modest contribution of the two indicators to explaining the differences between countries. The ANOVA test shows that the overall model is not significant at the 0.05 threshold (F = 2.564, p = 0.099), but it is borderline and can be considered exploratory relevant, given the sample size and the nature of the macroeconomic variables.

The regression coefficients show that on the one hand, EGDI has a positive effect on GDP per capita (B = 109,519 USD, p = 0.195), but this effect is not statistically significant in the multivariable model, while EPI has a positive, but very weak and insignificant effect (B = 20,358 USD, p = 0.677).

The VIF value is below 2 (1.879) for both predictors, indicating the absence of severe collinearity problems, and the Durbin-Watson is 2.149, signalling the lack of autocorrelation of the residuals.

These results suggest that government digitalization (EGDI) is positively and moderately correlated with the GDP per capita, but the results do not allow the generalization of this relationship due to the lack of strict statistical significance, but they strengthen the theoretical arguments regarding the importance of digital transformation in increasing economic efficiency, transparency and investment attractiveness (Venkatesh et al., 2016; United Nations, 2022).

The regression model highlights the existence of a cluster of macroeconomic or structural factors that can explain the variation in GDP per capita (education, innovation, labour productivity). Therefore, integrating other variables in future analyses could provide a more complete picture of the determinants for sustainable economic development in the EU.

*Table no. 3 Multiple Regression Analysis Results Predicting TaxGDP*

| | R | R Square | Adjusted $R^2$ | Std.Beta | Std. Error | UnStd. Beta | t | VIF | F change |
|---|---|---|---|---|---|---|---|---|---|
| Constant/ TaxGDP | 0,569 | 0,324 | 0,268 | | 13,948 | -11,186 | -0,802 | | 5,758 |
| EGDI | | | | 0,696 | 21,598 | 64,222 | 2,974 | 1,947 | |
| EPI | | | | -0,211 | 11,974 | -10,793 | -0,901 | 1,947 | |

*Source:* made by authors

The second multiple regression model has TaxGdp as the dependent variable and EGDI and EPI predictors. The results, $R^2 = 0.324$, indicate that 32.4% of the variation in the Tax Revenue as Percentage of GDP is explained by the level of government digitalization and e-participation.

The model is statistically significant ($F = 5.758$, $p = 0.009$), suggesting that at least one of the included predictors contributes significantly to explaining the variation in TaxGdp.

EGDI has a positive and significant effect on TaxGdp ($B = 64.222$, $p = 0.007$). Thus, a one-unit increase in the EGDI index (theoretically from 0 to 1) would be associated with an increase in the Tax Revenue as Percentage of GDP of approximately 64.2 percentage points. In practice, marginal increases in EGDI lead to improvements in tax efficiency, in line with recent literature (Gupta et al., 2021; United Nations, 2022).

EPI has a negative coefficient ($B = -10.793$), but this effect is not statistically significant ($p = 0.376$). This indicates that although e-participation is correlated with overall digitalization, it does not directly influence the Tax Revenue as Percentage of GDP.

VIF values are below 2 (1.947), indicating the absence of multivariate collinearity between predictors.

Durbin-Watson value is 2.252, suggesting the lack of autocorrelation of the residuals and, implicitly, the adequacy of the estimated model.

These results reveal that the public services digitalization and the e-administrative infrastructure contribute more to increasing fiscal efficiency than to directly boosting economic performance measured by GDP per capita.

The integrated interpretation of the two models suggests that e-government, measured by EGDI, has clearer positive effects on fiscal consolidation than on immediate economic development, but there are indications of a positive effect on GDP per capita as well, even if insignificant in the current model. E-participation, although correlated with EGDI, does not prove to be a significant predictor in any of the models tested, which could be explained by the fact that the mere possibility of citizens to interact digitally with the administration does not necessarily imply direct economic and fiscal effects. This is in line with recent literature, which emphasizes that e-participation is rather a catalyst for democratic governance and transparency (United Nations, 2022), and its economic effects require a mature institutional context and coherent digital integration policies.

In light of these results, it can be concluded that investments in e-government infrastructure have the potential to support fiscal sustainability by making public revenue collection more efficient and improving tax compliance. At the same time, the indirect effects on overall economic development require further exploration, as relationships mediated by factors such as digital human capital, the investment climate and the quality of institutions are possible.

The results of the study are relevant for public decision-makers in the analysed countries, as they highlight the importance of e-government not only as a tool for administrative modernization, but also as a driver of fiscal consolidation and, potentially, sustainable economic development.

## 5. Conclusions

The present study explored the impact of the e-Government Index (EGDI) and the e-Participation Index (EPI) on GDP per capita and the tax-to-GDP ratio in European countries. Analysis through two separate multiple regression models revealed that the EGDI has a significant positive effect on the tax-to-GDP ratio, suggesting that the digitalization of public services contributes to the efficiency of tax collection and the increase in the degree of voluntary compliance. In the case of GDP per

capita, the EGDI effect was positive, but not statistically significant, indicating that the benefits of administrative digitalization on the national economy may take longer to manifest. The e-Participation (EPI) did not prove to be a significant predictor in any of the models tested, highlighting that the mere existence of e-participation tools does not automatically generate direct economic or fiscal effects, in the absence of an integrated strategic use.

From an academic perspective, the study extends the literature on government digitalization by demonstrating the direct relationship with national fiscal performance. Managerially, the results suggest that e-government policies should be prioritized in the fiscal modernization strategy, to increase the degree of collection and transparency, with potential effects on budgetary consolidation. At the same time, the development of e-participation components should be aligned with institutional objectives to ensure a concrete impact.

The main limitations consist of the small sample size and the absence of control variables such as political stability, the digital education degree and institutional quality. In addition, the cross-sectional design does not capture the dynamic effects of digitalization over time.

To strengthen the conclusions, future research should use panel data and integrate relevant control factors. At the same time, it is recommended to apply Structural Equation Modeling (SEM) models to test the direct, indirect and moderate effects between digitalization, fiscal efficiency and sustainable economic development. Extending the analysis to a global level and investigating the relationship between e-participation, citizen trust and governance quality would provide an integrated perspective on public digitalization.

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