

Is GRDP a mediating factor in enhancing local tax revenues due to ICT development in Indonesia?

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ABSTRACT

Purpose: This study aims to investigate whether the Gross Regional Domestic Product (GRDP) of the information and communication sector mediates the relationship between Information and Communication Technology (ICT) development and local tax revenue enhancement across districts and municipalities in Indonesia.

Design/Methodology/Approach: This study uses a quantitative approach to examine how ICT growth, access, infrastructure and utilization affect local taxes and regional levies using panel data from 2017 to 2021. The GRDP of the information and communication sector is incorporated as a crucial moderating variable.

Findings: The findings reveal that the GRDP of the information and communication sector plays a vital moderating role in the relationships between ICT factors and local taxes and levies. ICT development benefits local tax systems through increased efficiency, transparency, reduced disparities and enhanced accessibility. Effective ICT infrastructure enables digital fiscal transactions, increasing revenues while improving collection efficiency and reducing income disparities among provinces. High ICT utilization supported by technological proficiency enables local governments to enhance local taxes and levies.

Practical Implications: An increase in the GRDP of the information and communication sector leads to higher tax revenues for local governments, funding public services and infrastructure development. Additionally, it attracts investments from other sectors, boosting regional levies and promoting overall regional economic development. The study highlights leveraging the GRDP of this sector as a strategic factor to enhance local tax revenue and regional levies across Indonesian provinces contributing to fiscal decentralization efforts.

Keywords: Fiscal decentralization, GRDP, ICT, Local levies, Local taxes, Regional development.

1. INTRODUCTION

Numerous governments have adopted fiscal decentralization policies, transferring greater authority for fiscal decision-making to regional or local levels of government (Arends, Brik, Herrmann, & Roesel, 2023; Liu & Song, 2022; Pietrovito, Pozzolo, Resce, & Scialà, 2023). The degree of transparency in local governance plays a crucial role in achieving efficient decentralization. There exists a substantial relationship between transparency metrics and the involvement of the inhabitants in numerous countries irrespective of their scale (Voitenko, Shults, Bilyk, & Kaplenko, 2022). The core principle of fiscal decentralization is exemplified by the local governments' achievement of financial autonomy which is accomplished by accumulating financial resources at a particular level of government (Krysovaty, Desyatnyuk, & Tkachyk, 2022). Enhanced local revenue positively impacts public service accessibility and poverty reduction (Sanogo, 2019). Decentralizing financing sources has the potential to greatly boost local economic activity which in turn might impact the overall rise in regional economic growth which can substantially contribute to economic growth in Indonesia (Subroto & Baidlowi, 2022). However, utilization of energy is also essential to Indonesia's economic growth which is not only reliant on fiscal decentralization (Elfaki, Poernomo, Anwar, & Ahmad, 2018; Purnomo et al., 2023; Suharno Suharno & Anwar, 2023).

Tax capacity and financial development benefited from fiscal decentralization which gave local self-governments the power to manage their finances, including tax collection and spending (Skoromtsova, Chaika, Onishchuk,

Holovii, & Pankova, 2022). Enhancing the quality of financial reporting and accountability is expected to enhance public confidence and encourage greater participation in local tax payments (Zamzami & Rakhman, 2023). The municipal government is eliminating specific municipal taxes and charges within the tourism industry to accelerate its resurgence in light of the COVID-19 pandemic's economic recovery (Rutynskyi & Kushniruk, 2020). Clear proof of localized tax competitiveness within provinces has long been considered a key driver of rapid economic development (Liu, Tai, & Yang, 2020). In Indonesia, there is significant untapped potential for growth in entertainment, hotel and parking taxes as they demonstrate substantial revenue growth beyond local taxes (Arintoko & Bawono, 2021).

Nevertheless, disparities in local taxes and fees persist. The disparity makes it challenging to boost revenue growth in regencies and it is essential to explore sources beyond local tax revenues such as zakat and donations (Wibisono & Muda, 2019). Although attempts have been made to reduce inequalities, the socioeconomic circumstances of different areas continue to negatively impact how well local governments are doing financially in terms of tax revenue (Flaška, Rigová, Kološta, & Liptáková, 2021). When residential segregation is viewed as the social manifestation of income disparities in a local community, the link between the delivery of regional public services becomes challenging (Cortés, 2021). When it comes to local government property taxes, the majority of homes no longer qualify for property taxes and mortgage interest exemptions (Ambrose, Hendershott, Ling, & McGill, 2022). The issue of choosing a suitable tax information system collaborator for a local tax department can result in inefficient tax collection in local government (Fu, Xue, Xu, & Yang, 2019).

Gross Regional Domestic Bruto (GRDP) is one factor that can measure a region's economic development (Hilmawan & Clark, 2021; Isyandi & Trihatmoko, 2022; Lestari, Hasid, Busari, & Ananda, 2022). Additionally, regions that obtain economic resources frequently succeed. This victory is closely tied to inclusive GRDP growth, a skilled workforce and robust infrastructure facilities (Rosyadi, Hasid, & Purwadi, 2023). The relationship between GRDP and taxes is evident because the favourable effects of tax incentives linked to urban revitalization initiatives on GRDP indicate the necessity for more substantial tax incentives for housing (Chung & Yoon, 2023).

The ideal level of ICT service delivery in the two cities is within a decentralized system where ICT spending is funded through a consistent tax imposed on the residents of each city (Batabyal & Beladi, 2019). The substantial impact of ICT on civilization is evident. However, the uneven development of ICT has given rise to a digital divide which influences the economy (Suharno, Anwar, & Priambodo, 2022). Using national efforts for regulatory reform, ICT-driven strategies and outsourcing services to the private sector resulted in an augmentation of property tax collections (Awasthi, Nagarajan, & Deininger, 2021). The presence of ICT infrastructure and the quality of governance can affect the mobilization of tax revenues both directly and indirectly (Mallick, 2021).

This study elucidates the correlation between the advancement of ICT, access to ICT infrastructure and the use of ICT on local tax and regional levy revenues in regencies and municipalities in Indonesia based on the aforementioned explanation. Furthermore, this study analyzes the impact of GRDP in the information and communication sector as a moderating variable. According to the studies by Wibisono and Muda (2019), Flaška et al. (2021); Cortés (2021), Ambrose et al. (2022) and Fu et al. (2019), local revenue plays a crucial role and the existence of disparities, economic inequalities and complex and inefficient regional services can pose obstacles to the collection of local taxes and regional levies. However, the direct relationship between ICT and local taxes and regional levies is still underexplored. Hence, the research gap in this study aims to analyze the relationship between ICT, GRDP in the information and communication sector and local taxes and regional levies. This research holds significant relevance in efforts to enhance local taxes and regional levy collection in regencies and municipalities in Indonesia. Therefore, it is anticipated that ICT variables can provide solutions to overcome these obstacles in local tax and regional levy collection.

2. LITERATURE REVIEW

2.1. The Impact of ICT on Local Taxes and Levies

The government's engagement with information technology can result in the adoption of e-government which promotes the modernization of public administration, the adoption of technology and the competitiveness of ICT. This can enhance government efficiency and boost local tax revenue (Mătuescu & Glăvan, 2012). Implementing information technology in e-government can enhance tax revenue administration, thereby optimizing potential tax revenue (Burdenko & Bykasova, 2023). The effect of ICT can enhance the connection between individuals and

the government, thereby affecting the transparency of local taxes and leading to an increase in local tax rates (Olaniyan & Faniran, 2011). There is a need for policies to encourage the digital automation of tax procedures since information technology has a statistically substantial beneficial impact on tax revenue (Jemiluyi & Jeke, 2023). Implementing ICT in managing local taxes can help improve efficiency, transparency and citizen participation in paying local taxes (Ziemba, 2021).

Hypothesis 1: ICT has an impact on local taxes and levies.

2.2. The Impact of Access and ICT Infrastructure on Local Taxes and Levies

The ICT infrastructure and governance quality do not significantly impact overall tax revenue because some may avoid taxation by conducting transactions outside the ICT system (Mallick, 2021). The ICT infrastructure the community and citizens use positively reduces the relationship between government service digitalization and tax evasion and digitization can help the country reduce tax evasion and increase tax revenue (Uyar, Nimer, Kuzey, Shahbaz, & Schneider, 2021). Improving ICT infrastructure is correlated with a rise in local tax income contributing to economic growth (Yoshino, Siregar, Agarwal, Seetha Ram, & Azhgaliyeva, 2022). Information technology infrastructure is crucial for expanding the tax base and ensuring timely tax payments which can enhance tax revenue collection (Adedeji & Lipede, 2023).

Hypothesis 2: Access and ICT infrastructure impact local taxes and levies.

2.3. The Impact of the Use of ICT on Local Taxes and Levies

Increased income indicates that ICT enables better tax management (Chatama, 2013). The use of ICT to influence compliance behavior is partly based on behavioral intentions and the results indicate that performance and work standards have significant direct and indirect effects on tax compliance behavior (Kiria, James, & Masunga, 2020). ICT can help analyse how it may be implemented, extended and used by regional administrations to improve governance. It can also allow a more transparent and accountable income collection system, benefitting both the government and taxpayers (Canares, 2016). Automated tax information systems can optimize local taxes, simplifying the tax collection and billing process while reducing potential errors in tax computations and reporting, therefore enhancing taxpayer compliance and local tax revenue (Gration, Oriko, & Anselmi, 2016).

Hypothesis 3: The use of ICT impacts local taxes and levies.

2.4. The Impact of GRDP in the Information and Communication Sector as a Moderator in the Relationship between ICT and Local Taxes and Levies

ICT is one of the determining variables for regional income inequality in all provinces on Java Island with investment, labor and education levels (Wilantari, Latifah, Wibowo, & Al Azies, 2022). The emergence of ICT coincides with changes in the economic system that provide relatively more favorable prospects for the industrial structure's economy in the top areas (Andersson & Klinthäll, 2012). The presence of economic growth and the growth of ICT can influence the government system leading to the establishment of e-government. Public administration is a crucial stakeholder having an impact on sustainability and ICT provides benefits for digitalized administration (Ziolo et al., 2022). The development of ICT can be used as a proxy for tax revenue mobilization in addition to total tax income as a proportion of GDP and tax revenue as a percentage of GDP (Adegboye et al., 2022).

Hypothesis 4: GRDP in the information and communication sector as a moderator in the relationship between ICT and local taxes and levies.

2.5. The Impact of GRDP in the Information and Communication Sector as a Moderator in the Relationship between Access and ICT Infrastructure and Local Taxes and Levies

Developing more advanced ICT infrastructure can also support the growth of the industrial sector and innovation in the region (Crespo-Rincón, Jordá-Borrell, & Ruiz-Rodríguez, 2023). The government should invest more in ICT infrastructure to enhance resilience, reduce future crises and foster innovation, productivity and competitiveness (Kim, 2022). Information regarding tax regulations can also be easily accessed by taxpayers enabling them to comply with their tax obligations with the evolving ICT infrastructure (Harkushenko, 2022). Government authorities ought to finance or encourage developments in ICT infrastructure to implement measures aimed at

preventing tax fraud and corruption which will further encourage taxpayers to fulfill their obligations (Rojniruttikul & Vajrapatkul, 2021). The dissemination of information makes regional economies more homogeneous by reducing differences in institutions and cultures as well as the telecommunications capacity represented by a region's internet infrastructure (Celbis & De Crombrughe, 2018).

Hypothesis 5: GRDP in the information and communication sector as a moderator in the relationship between access and ICT infrastructure and local taxes and levies.

2.6. The Impact of GRDP in the Information and Communication Sector as a Moderator in the Relationship between the Use of ICT and Local Taxes and Levies

ICT can influence the quality of governance at the central and local levels. For instance, in the workforce, research and development levels, lifelong learning and its connection to gross domestic product (Billon, Lera-Lopez, & Marco, 2017). The level of ICT utilization can predict a country's well-being even after considering GDP. Numerous other control variables also impact the country's prosperity (Ganju, Pavlou, & Banker, 2016). The level of internet usage should be used to evaluate the success of the digital economy and how it is developing (Timin & Baybakova, 2021). E-governance can enhance efficiency in local tax revenue collection by implementing online taxation to achieve good governance (Noviyanti, Raka, & Larantika, 2021). Broadband internet access is paramount in supporting economic activities as the variety of economic activities directly impacts the quantity of taxes gathered (Valentín-Sívico, 2020).

Hypothesis 6: GRDP in the information and communication sector as a moderator in the relationship between the use of ICT and local taxes and levies.

3. RESEARCH METHOD

This study employs panel data that integrates cross-sectional and time-series data into a two-dimensional framework. The cross-section represents the subjects whereas the time series refers to the time variable and includes information from multiple subjects across multiple periods. Panel data provide greater flexibility in analyzing dynamic changes while controlling for individual differences (Agung, 2014).

Previous research has used panel data to examine the development of ICT over time as it can be observed and studied in a longitudinal manner. Nath and Liu (2017) primarily focused on connecting ICT development with variables such as access, use and skill. Castaldo, Fiorini, and Maggi (2018) employed panel data to analyze the impact of mobile technology on economic growth while Ali, Alam, Taylor, and Rafiq (2020) used panel data to examine the relationship between ICT maturity and economic development. Dahmani, Mabrouki, and Ben Youssef (2022) explored the long-term relationship between ICT, international trade and economic growth using panel data. Njangang, Beleck, Tadadjeu, and Kamguia (2022) investigated the relationship between ICT and wealth inequality using the same research method. Additionally, Wandaogo (2022) employed panel data to examine the impact of digitization on government effectiveness in developed countries.

The secondary data used in this study are time series and cross-sectional data for five years from 2017-2021 in 34 provinces in Indonesia. This research uses the ICT index in each province in Indonesia. Meanwhile, local taxes and levies constitute an accumulation for each province in Indonesia. This research methodology uses secondary data to collect data for this research including documentation from library studies and various sources, including journals, papers, the internet and other literature.

Table 1 presents variables and an operational definition of the concept.

Table 1. Variables and operational definition of concept

Variables	Operational definition of a concept
ICT development	An index is a composite index compiled from three sub-indices and each sub-index consists of constituent indicators namely access and infrastructure, usage and expertise (Badan Pusat Statistik, 2023).
Access and ICT infrastructure	An index includes the following: international internet bandwidth per user, mobile phone and fixed-line phone subscribers per 100 population, the proportion of homes having computers and the proportion of homes having internet connections (Badan Pusat Statistik, 2023).
The use of ICT	An indicator made up of the proportion of people who use the internet and the

Variables	Operational definition of a concept
	number of active mobile broadband and internet users per 100 people (Badan Pusat Statistik, 2023).
Gross regional domestic product (GRDP) in the information and communication sector	Activities related to publication include the creation of motion pictures, videos, television shows, sound recording, music publishing, programming, broadcasting, telecommunications, development and information services (Badan Pusat Statistik, 2023).
Local taxes and levies in districts and municipalities	Indonesia Law No. 28 of 2009 regarding local taxes in regencies and municipalities includes groundwater tax, swiftlet nest tax, restaurant tax, street lighting tax, parking fee, hotel tax, entertainment tax, advertising tax, rural and urban land and building tax, non-metallic mineral and rock tax, and land and building acquisition duty. Indonesia Law No. 28 of 2009 regarding regional levies in regencies and municipalities includes health service fees, motor vehicle testing fees, waste management and cleanliness service fees, replacement fees for the issuance of identity cards and civil registry certificates, market service fees, burial and cremation service fees, roadside parking service fees, fire safety equipment inspection fees, ribbon printing replacement fees, toilet facility provision and cleaning fees, wastewater treatment fees, calibration and recalibration service fees, education service fees and telecommunications tower control fees.

This study uses the interpretation of the Common Effect Model (CEM), Fixed Effect Model (FEM) and Random Effect Model (REM) to determine the correct panel data regression (Tsonias, 2019). This research employs panel data regression analysis using the following equation model:

$$LTL_{it} = \alpha + \beta_1 ICT_{it} + \beta_2 AI_{it} + \beta_3 UI_{it} + \varepsilon_{it} \quad (1)$$

$$LTL_{it} = \alpha + \beta_1 ICT_{it} + \beta_2 AI_{it} + \beta_3 UI_{it} + \beta_5 GRDP_{it} + \beta_6 GRDP * ICT_{it} + \beta_7 GRDP * AI_{it} + \beta_8 GRDP * UI_{it} + \varepsilon_{it} \quad (2)$$

Where LTL is local taxes and levies β is the regression constant, ICT is ICT development, X_2 is access and ICT infrastructure, X_3 is ICT use, GDRP is the Gross Regional Domestic Product of the information and communication sector ε is an error, i is cross-sectional data and t is time series data. Figure 1 illustrates the research framework and hypotheses.

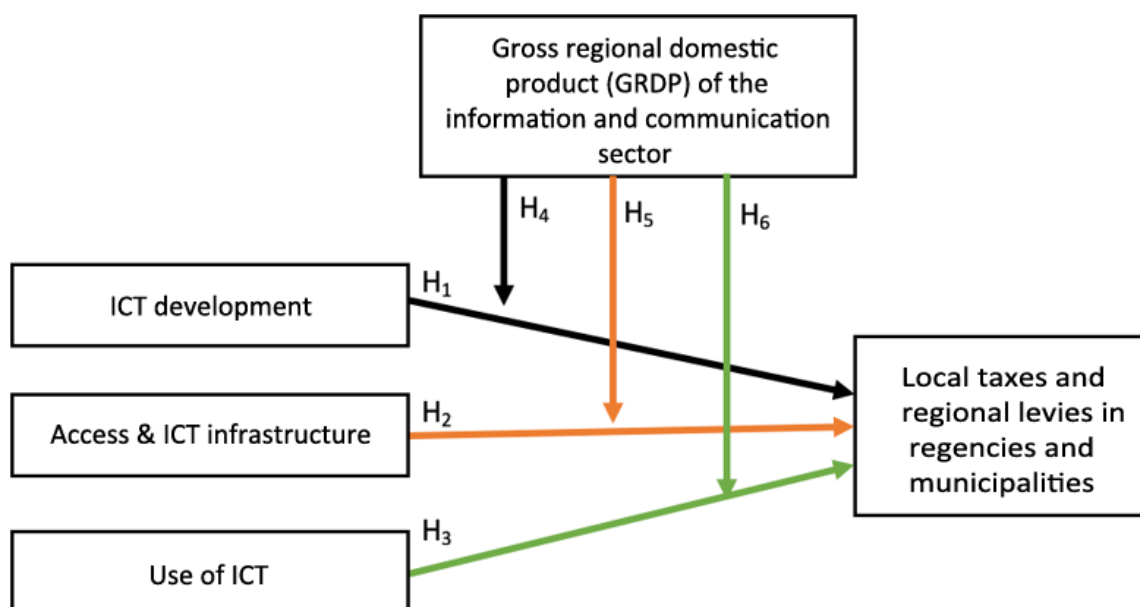


Figure 1. The research framework and hypotheses.

4. RESULTS

Table 2 shows the results of the root test calculation using the Augmented Dickey-Fuller (ADF) Fisher Chi-square. The statistic value is 95.4777 with a probability value of $0.0157 < 0.05$ indicating stationarity in the local tax and levies variable. Similarly, in other variables such as ICT, access and ICT infrastructure, use of ICT, ICT skills and the moderation variable GRDP, the probability values are less than 0.05 indicating stationarity.

Table 2. Estimated results of unit root test calculations.

Variables	Statistic	Prob.	Conclusion
Local tax and levies	94.4065	0.0188	Stationary
ICT	122.053	0.0001	Stationary
Access and ICT infrastructure	113.167	0.0005	Stationary
Use of ICT	99.2215	0.0081	Stationary
GRDP	95.4777	0.0157	Stationary

Table 3 exhibits the outcomes derived from the administration of the Chow test and the Hausman test. The Chow test can be discerned by examining the probability value associated with the chi-square statistic for the cross-section while the Hausman test can be ascertained by inspecting the random value for the cross-section. According to Equation 1, the chi-square value for the cross-section is 686.570074 accompanied by a probability value of $0.0000 < 0.05$, thereby signifying that the Fixed Effect Model (FEM) is the preferred choice over the Common Effect Model (CEM).

The Hausman test was implemented to determine whether the FEM or the Random Effect Model (REM) should be selected. The findings of the Hausman test for Equation 1 can be gleaned from the random value for the cross-section which stands at 20.691575 with a probability value of $0.0001 < 0.05$ culminating in the conclusion that the FEM is the most appropriate model.

According to Equation 2, the chi-square value for the cross-section is 315.090690 accompanied by a probability value of $0.0000 < 0.05$ indicating that the Fixed Effect Model (FEM) is the preferred choice over the Common Effect Model (CEM). Consequently, the Hausman test was administered to discern whether the FEM or the Random Effect Model (REM) should be employed. The results of the Hausman test for Equation 2 can be deduced from the random value for the cross-section which is 207.842402 with a probability value of $0.0000 < 0.05$ leading to the conclusion that the FEM is the most appropriate model.

Table 3. Chow and Hausmann tests.

Equation 1	Statistic	Prob.	Conclusion
Cross section chi-square	686.570	0.0000	FEM
Cross-section random	20.692	0.0001	
Equation 2	Statistic	Prob.	Conclusion
Cross section chi-square	315.091	0.0000	FEM
Cross-section random	207.842	0.0000	

Table 4 shows that the value of Prob (F-statistic) in Equation 1 is $0.000000 < 0.05$ which means that the independent variables namely ICT, All, and UI significantly affect the dependent variable (LTL). In Equation 2, the value of Prob (F-statistic) is also $0.000000 < 0.05$ which means that the independent variables, namely ICT, All, and UI and the moderating variable, GRDP significantly affect the dependent variable(LTL).

The adjusted R-Square in Equation 1 is 0.989035 which means that the independent variables, namely ICT, All, UI and IS can explain 98.90% of the dependent variable's fluctuation (LTL). Other variables outside the research model explain the remaining 1.10%. The adjusted R-Square in Equation 2 is 0.994600 which means that the independent variables, namely ICT, All, UI and the interaction with the moderating variable GRDP can explain 99.46% of the variation in the dependent variable (LTL). Other variables outside the research model explain the remaining 0.54%. The increase in the adjusted r-square value between Equation 1 and Equation 2 proves that the presence of a moderating variable can strengthen the relationship between the independent and dependent variables.

Table 4. Probability test.

Equation 1		Equation 2	
Prob (F-statistic)	0.000000	Prob (F-statistic)	0.000000
Adjusted R-square	0.989	Adjusted R-square	0.995

Table 5 displays the outcomes of the panel data regression analysis using two equations: the equation before using the moderation variable and the equation after using the moderation variable. This study uses a significance level of 5% or if the probability value is less than 0.005, the result is significant.

In the first equation, the probability value of the ICT variable for LTL is $0.0006 < 0.05$, so H1 is accepted which means that ICT affects local taxes and levies in regencies and cities. The probability value of all variables for the LTL variable is $0.0012 < 0.05$, so H2 is accepted which means that access and ICT infrastructure affect local taxes and levies in regions and cities. The probability value of the UI variable for the LTL variable is $0.0026 < 0.05$, so H3 is accepted which means that ICT usage affects local taxes and levies in regions and cities.

The second equation uses the GRDP variable as a moderating variable. The probability value of the ICT variable with the GRDP variable as a moderating variable against the LTL variable is $0.0000 < 0.05$, so H4 is accepted which means that GRDP can moderate the relationship between the ICT and the local taxes and levies in regencies and cities. The probability value of all variables with the GRDP variable as a moderating variable against the LTL variable is $0.0000 < 0.05$, so H5 is accepted which means that GRDP can moderate the relationship between access and ICT Infrastructure and the local taxes and levies in regencies and cities. The probability value of the UI variable with the GRDP variable as a moderating variable against the LTL variable is $0.0000 < 0.05$, so H6 is accepted which means that GRDP can moderate the relationship between the use of ICT and the local taxes and levies in regencies and cities.

Table 5. The result of panel data.

Equation 1				
Variable	Coefficient	Std. error	t-statistic	Prob.
Constant	13928.750	3957.888	3.519	0.0006
ICT development	-9057.308	2742.312	-3.303	0.0012*
Access and ICT infrastructure	3311.814	1080.661	3.065	0.0026*
Use of ICT	4031.982	1197.657	3.367	0.0010*
Equation 2				
Variable	Coefficient	Std. error	t-statistic	Prob.
Constant	-192.820	3082.858	-0.063	0.9502
ICT development	861.708	2181.081	0.395	0.6934
Access and ICT infrastructure	25.154	853.087	0.029	0.9765
Use of ICT	-447.439	956.128	-0.468	0.6406
Gross regional domestic product of the information and communication sector	0.532	0.091	5.868	0.0000
Gross regional domestic product of the information and communication sector *ICT development	-0.321	0.041	-7.794	0.0000*
Gross regional domestic product of the information and communication sector * access and ICT infrastructure	0.107	0.023	4.548	0.0000*
Gross regional domestic product of the information and communication sector * use of ICT	0.134	0.013	10.616	0.0000*

Note: *The level of significance $\alpha = 5\%$.

5. DISCUSSION

The analysis results show that ICT development affects regional taxes and retributions for regencies and municipalities. This is in line with the research of [Mătuescu and Glăvan \(2012\)](#), [Olaniyan and Faniran \(2011\)](#), [Ziamba \(2021\)](#), [Burdenko and Bykasova \(2023\)](#) and [Jemiluyi and Jeke \(2023\)](#) which states that information and communication technologies and local taxation are related. Thus, ICT can increase efficiency and effectiveness to improve the performance of regional taxes and levies in districts and cities. ICT development in local tax management can reduce administrative costs and speed up data collection. In addition, ICT development can increase transparency and accountability in the local tax system, thereby reducing the potential for fraud and tax abuse.

ICT access and infrastructure affect local taxes and levies for regencies and municipalities. This is in line with the results of [Mallick \(2021\)](#), [Uyar et al. \(2021\)](#), [Yoshino et al. \(2022\)](#) and [Adedeji and Lipede \(2023\)](#). The existence of a good ICT infrastructure can also increase public accessibility by paying taxes online to increase local tax revenues and regional levies. Uneven ICT access and infrastructure have the potential for suboptimal local tax revenues and regional levies.

According to research by [Chatama \(2013\)](#), [Canares \(2016\)](#), [Gratton et al. \(2016\)](#) and [Kiria et al. \(2020\)](#), the use of ICT affects local taxes and levies in regencies and municipalities. The use of ICT can affect regional taxes and retributions in districts and cities because many human resources have not mastered ICT. Thus, income from regional taxes and regional levies is not optimal. Using good ICT will increase the potential for local tax revenue and regional levies to improve taxpayer compliance.

According to the research of [Andersson and Klinthäll \(2012\)](#), [Zioło et al. \(2022\)](#), [Wilantari et al. \(2022\)](#) and [Adegboye et al. \(2022\)](#), the GDP of the information and communication sector can moderate the relationship between ICT development and local taxes and levies. The GDP of the information and communication sector can moderate the relationship between ICT development and regional taxes and levies because the GDP of the information and communication sector indicates the degree to which a region's digital economy has developed. ICT development can encourage the growth of the digital economy which in turn can increase local tax revenue and regional levies. However, this influence is even more significant if the GDP of the information and communication sector in the area is sufficiently high.

The GDP of the information and communication sector can moderate the relationship between ICT access and infrastructure with local taxes and levies and is in line with the research of [Celbis and De Crombrughe \(2018\)](#), [Harkushenko \(2022\)](#), [Kim \(2022\)](#) and [Crespo-Rincón et al. \(2023\)](#). The GDP of the information and communication sector can moderate the relationship between ICT access and infrastructure with local taxes and regional levies by increasing local tax revenue and regional levies from various sectors. These sectors are always related to information and communication technologies. A good ICT infrastructure will make it easier for taxpayers to report and pay taxes.

The GDP of the information and communication sector can moderate the relationship between ICT use and local taxes and local levies and is in line with the research of [Ganju et al. \(2016\)](#), [Billon et al. \(2017\)](#), [Valentín-Sívico \(2020\)](#), [Noviyanti et al. \(2021\)](#) and [Timin and Baybakova \(2021\)](#). ICT can increase business efficiency and effectiveness, thereby increasing revenue. Increasing corporate revenue can increase corporate tax payments to local governments. In addition, ICT can be used because human resources who master ICT can easily apply technology that can support regional taxes and levies.

6. CONCLUSION

ICT development benefits local tax systems by boosting efficiency, effectiveness and reducing administrative costs in tax and levy collection, thereby supporting fiscal decentralization efforts. ICT can improve transparency and accountability in the local tax system by facilitating real-time monitoring and reporting of financial transactions. It can reduce disparities in local taxes and regional levies across regencies and municipalities as well as enhance accessibility and efficiency in tax and levy collection. An effective ICT infrastructure can enhance public accessibility by facilitating online tax payments and increasing local tax revenues and regional levies. ICT infrastructure can also improve the efficiency of local tax and levy collection, thereby reducing income disparities among provinces in Indonesia's vast archipelagic geography. The utilization of ICT can have an impact on regional taxes and retributions in both urban and rural areas as a significant number of human resources have become proficient in

ICT. Local governments can more easily improve local taxes and regional levies with high ICT usage and sufficient technological support. An increase in the GRDP of this sector can lead to increased tax revenues for local governments, thereby enhancing their ability to fund public services and infrastructure development in line with fiscal decentralization goals. Furthermore, the growth of the information and communication sector can also attract investments from other sectors, thereby boosting regional levies and promoting overall economic development.

6.1. Theoretical Implications

ICT development, access, use of ICT, GRDP in the information and communication sector, taxation and regional levies can be of great value to district and city local governments in supporting fiscal decentralization efforts. Adding the GRDP of the information and communication sectors as a moderating variable strengthens this study's connection. ICT advancements can improve tax collection efficiency and effectiveness, reduce administrative costs, and increase transparency and accountability in the local tax system. This study theorizes that ICT advancements can diminish tax and levy disparities, potentially boosting local income in regencies and municipalities in Indonesia.

6.2. Managerial Implications

This study provides crucial recommendations for policymakers at the central and local levels in Indonesia to boost local taxes and levies that contribute to fiscal decentralization efforts. Local governments with robust ICT infrastructure can enhance public services and foster community satisfaction and trust. The growth of the information and communication sector should be incentivized to elevate GRDP, influencing the increase in local taxes and regional levies. This necessitates the expansion of human resources to optimize ICT usage, driving revenue generation in every district and municipality throughout Indonesia.

7. LIMITATIONS AND FUTURE RESEARCH

This research has certain limitations as it only assesses the effects of ICT development, access, infrastructure and usage as well as the role of GRDP in the information and communication sector as a moderating variable on the acceptance of local taxes and retributions in districts and municipalities across Indonesia. Future studies could consider incorporating additional variables such as economic growth rates, employment levels, educational attainment, technological innovation or other factors that may impact ICT development in order to gain a more comprehensive understanding of the influence of ICT development on regional levies and overall economic development.

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INSTITUTIONAL REVIEW BOARD STATEMENT

Not applicable.

TRANSPARENCY

The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

COMPETING INTERESTS

The authors declare that they have no competing interests.

AUTHORS' CONTRIBUTIONS

All authors contributed equally to the conception and design of the study. All authors have read and agreed to the published version of the manuscript.

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