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Analysis of the Impact of Digitalization and Labor Force Participation Rate on Gross Regional Domestic Product in Indonesia

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ABSTRACT
This study examines how digitalization and labor force participation affect Indonesia's regional gross domestic product between 2018 and 2023 and uses panel data from 34 provinces. GRDP is the dependent variable, and the independent variables are internet usage, number of merchants, and activity level. The data were obtained from the Central Statistics Agency (BPS) and Bank Indonesia (BI). The analysis method used is multiple regression processed with E-views 12. The research findings show that GRDP is positively and significantly influenced by internet usage, the number of merchants, and the labor force participation rate by using the selected fixed effect model. These results indicate that the availability of access and use of digital technology and the level of labor market participation are key to improving the Indonesian economy.

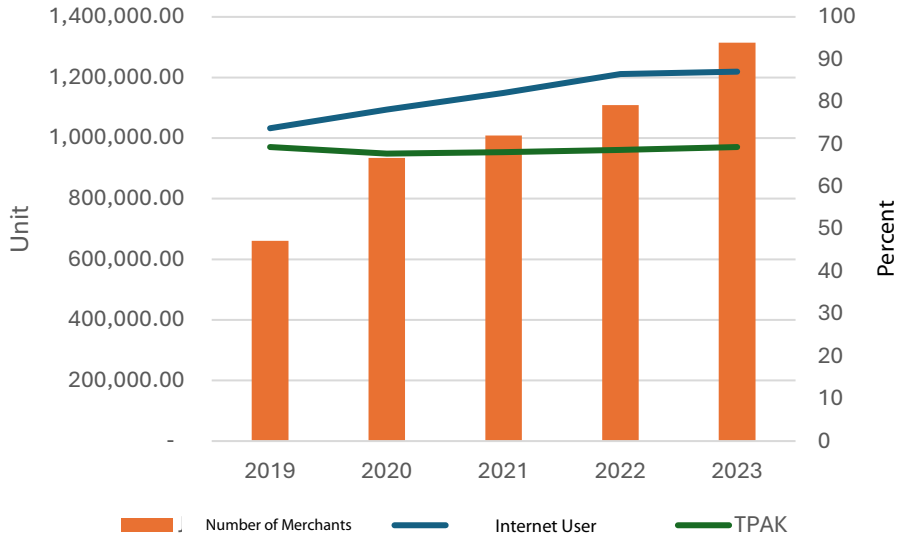
Keywords: Internet, Merchant, Labor Force Participation Rate, Gross Regional Domestic Product.

I. Introduction

The economic growth of a country is fundamentally driven by its ability to leverage technological advancements effectively. Science and technology increase productivity and encourage structural changes in the economy. The Solow model explains that the factors that influence economic growth are capital accumulation, human resources, and technological advances. To realize Indonesia Emas 2045, the government has identified six main strategies, one of which is digital transformation. This strategy is not only limited to the use of technology but also involves improving the technological skills of human resources. Technological developments have become one of the main drivers of economic transformation. The digital revolution has not only changed patterns of social interaction but has also triggered structural shifts in a country's economy (Abdillah, 2024). The development of technology based on digitalization is closely related to financial management (Yefriza et al., 2024). With the development of technology, this will change the economy of people in a region. The relationship between digitalization and economic resilience demonstrates an inverted U-shaped curve as population density rises (Tian & Guo, 2023).

Digitalization is often defined as applying digital technology to improve efficiency and productivity. With its Golden Era 2045 vision, Indonesia has set a forward-looking vision for transforming into a developed country. In the digital era, digital transformation is the main force driving Indonesia's economic growth

(Gultom et al., 2024). As one of the main pillars, digitalization is expected to be a catalyst that accelerates the achievement of a developed country's status. With a large population and wide geographical distribution, digitalization is one way to equalize education and improve health services and government efficiency.



Graph 1. Development of Internet Users, Number of Merchants, and Labor Force Participation Rate in Indonesia 2019 -2023

Source: BPS and BI, 2024

As the backbone of this revolution, the internet has enabled unlimited connectivity and broad access to information. The acceleration of internet development driven by the digitalization process has led to the emergence of a digital economy (Aleksandrova et al., 2022). In Graph 1, the development of internet usage in Indonesia from 2018 to 2023 shows a consistent positive trend. In 2018, the level of internet users in Indonesia was 66.22%, which then increased to 82.7% in 2021. This increase continues to reach 87.09 in 2023.

Merchants providing non-cash payment transactions such as QR, debit, and credit cards have significantly changed the Indonesian economy. In chart 1, according to data from Bank Indonesia in 2019, the number of merchants was recorded at 661,080 units. This shows that the number of merchants increases every year. In 2023, the number of merchants was recorded at 1,315,095 units in Indonesia. The participation rate of the labor force is a significant element in a country's economic health. In Indonesia, the labor force participation rate in 2019 was 69.32%. However, there was a decline in 2020 to 67.77%. In 2023, this figure increased again to 69.3%. This study aims to analyze the influence of digitalization on internet usage, the number of merchants who make non-cash transactions, and the workforce on gross regional domestic product. This study is expected to provide recommendations for policymakers to design strategies that will increase economic growth and digital inclusion in Indonesia.

II. Research Method

2.1. Solow's Theory of Economic Growth

In neoclassical economics, the theory developed by Robert M. Solow and TW Swan in 1956 explains that economic growth is not only determined by the accumulation of capital and labor but also by technological progress and labor growth. Investment in physical capital, such as machinery and infrastructure, can increase a country's production capacity. Growth in the number of workers also contributes to economic growth. Increasing the number of workers can increase total output. Innovation and technological progress allow for more efficient use of capital and labor. Solow emphasized that without technological progress,

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economic growth would decline as returns from capital investment decreased. The Solow model shows that a country's economic growth follows a pattern. Initially, when capital investment increases, economic growth will be rapid. However, this growth will slow down over time due to diminishing returns from additional capital. In the long run, this model leads to equilibrium, where economic growth stabilizes. At this point, economic growth will depend on technological progress because capital accumulation and labor no longer significantly impact growth.

2.2. Economic growth

Economic growth, which can be measured through GRDP, reflects the increase in the production of goods and services in a region and has implications for increasing community income. Various factors contribute to economic growth, namely:

a) Foreign and domestic investments are important in increasing production capacity. Investments in infrastructure, technology, and human resources can drive efficiency and productivity.
b) The workforce's quality and skills significantly impact a country's economic competitiveness. Adequate education and training will produce a more productive workforce.
c) Innovation and the application of new technologies can increase production efficiency. Countries that can adapt to technological developments tend to experience faster growth.
d) Appropriate fiscal and monetary policies can create a conducive investment climate. A stable and transparent government tends to attract more investment.

2.3. Internet users

Internet users are connected to the Internet and use various services and facilities the global network provides. According to the United Nations (2005), internet users pay to access the public internet, regardless of the type of device or its speed. Meanwhile, ITU (2017) has a broader definition, including anyone who has used the internet in the last three months, regardless of the device or network used. The growth of internet users drives the development of the digital economy. Due to the growth of internet users, e-commerce, online services, and other digital industries are growing. Several studies have found that internet use significantly affects the economy (Jurayevich & Bulturbayevich, 2020; Lela et al., 2023; Pansera et al., 2024; Tanjung et al., 2022).

2.4. Merchant

Merchants can be individuals, groups, or business entities that sell goods and/or services online or offline. Bank Indonesia defines merchants as business entities that provide goods or services and accept payments through various electronic payment instruments. Merchants are equipped with special tools or devices (for example, EDC machines, QR codes, or payment applications) to accept consumer payments. Merchants contribute to the economy by creating jobs and increasing economic activity.

2.5. Workforce

Suparmoko (2002) states that the workforce is part of the population in the productive age range (15-64 years) and is involved in economic activities. Mulyadi (2008) has a similar view, adding that the workforce is ready to work if there is demand. Meanwhile, the World Bank defines the workforce as a group of individuals aged 15 years and over who have the potential to provide labor for production. Population growth will significantly affect the growth of the workforce. The Labor Force Participation Rate (LFPR) shows the percentage of the productive age population (usually 15-65 years old) actively looking for work or already working. The higher the LFPR, the more people contribute to the economy. Factors such as unemployment

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rate, education, and minimum wage can affect how many people are willing to work. Several previous studies (Akbar Asyari et al., 2024; Fatah et al., 2023; Puspasari, 2019; Romeo et al., 2023) Show that the labor force participation rate positively and significantly impacts the economy. This research is based on the following hypothesis:

H1 = The number of internet users positively and significantly influences regional gross domestic product.
H2 = The number of merchants significantly influences the gross regional domestic product.
H3 = The labor force participation rate positively affects gross regional GDP.

III. Research Method and Materials

This study uses panel data to examine the effect of labor force participation rate, number of merchants, and internet usage on GRDP in 34 provinces in Indonesia from 2019 to 2023. The data utilized in this study is sourced from Bank Indonesia (BI) and the Central Statistics Agency (BPS). Multiple regression analysis of panel data is the analysis technique used. In panel data regression, model selection is conducted using the Chow and Hausman tests. The Chow test helps decide between the Fixed Effect Model (FEM) and the Common Effect Model (CEM). Meanwhile, the Hausman test is used to choose between the Random Effect Model (REM) and the Fixed Effect Model (FEM). The regression equation used is as follows:

$$Yt = \beta 0 + \beta 1\ X1t + \beta 2\ X2t + \beta 3\ X3t + e$$

Information:
Yt = GRDP (billion rupiah)
β 0,1,2,3 = constant
X1t = Internet users (percent)
X2t = Number of Merchants (units)
X3t = Labor Force Participation Rate (percent)
e = error term

IV. Results and Discussion

4.1. Result of Study

Table 1 presents summary statistics of all variables in the form of mean, standard deviation, minimum, and maximum for the 170 observations in this study.

Table 1. Descriptive Analysis

	GRDP	Internet Users	Number of Merchants	Labor Force
Mean	336836.6	79.48218	29578.03	68.37106
Median	141776.6	82.07000	8116.500	68.67500
Maximum	2050466	98.08000	586600.0	78.29000
Minimum	26597.55	31.31000	2.000000	62.15000
Std. Dev	478418.9	11.87791	67627.18	3.373956
Obs	170	170	170	170

Source: Processed Data, 2024

In Table 1, the variable number of merchants has the most significant level of data distribution, which is 67627.18, which means that the number of merchants in each region in Indonesia tends to be different.

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Meanwhile, the labor force participation rate has a minor level of data distribution, which is 3.37, which means that the percentage of the labor force participation rate in each region in Indonesia tends to be the same.

Table 2. Model Selection Criteria

Chow Test	Cross-section Chi-square	833.263352
	Prob	0.0000
Hausman Test	Cross-section Random	77.676541
	Prob	0.0000

Source: processed data, 2024

The findings from the Chow and Hausman tests presented in Table 2 indicate that the adoption of a fixed effect model is the most suitable option for this study. This is because the probability value in both tests is minimal (0.000), far below the 5% significance level.

Table 3. Results of Regression Analysis

Variable	Coefficient	t-Statistic	Prob.
C	31673.53	0.243532	0.8080
Internet Users	900.5476	2.662940	0.0087
Number of Merchants	0.672348	7.825838	0.0000
Labor Force	4052.094	1.982552	0.0495
R-square			0.997715
Prob(F-statistic)			0.000000

Source: processed data, 2024

The form of the equation obtained is:

$$GRDP = 31673.53 + 900.5476INT + 0.672348MERC + 4052.094TPAK$$

The R-Square value in Table 3 is 0.99 or equal to 99 percent. This means that the variables of internet users, number of merchants, and TPAK can explain the variation in GRDP. Simultaneously, the prob value (F-statistic) of 0.0000 means that the independent variables in this study can influence the dependent variable simultaneously. When viewed from its partial influence (t-statistic), internet users positively and significantly affect GRDP. Thus, GRDP will increase by 900.54 billion rupiah for every 1 percent growth in internet usage. The number of merchants can also affect GRDP. When the number of merchants increases by 1 unit, GRDP will increase by 0.67 billion rupiah. Likewise, the labor force participation rate variable positively and significantly affects GRDP. Every one percentage increase in the labor force participation rate will increase GRDP by 4,052.09 billion rupiah.

4.2. Discussion

Based on the tests conducted, it was found that internet users significantly and positively influence the gross regional domestic product. This study is in line with the research conducted (Jurayevich & Bulturbayevich, 2020; Lela et al., 2023; Pansera et al., 2024; Tanjung et al., 2022) . The use of the Internet can increase productivity in various sectors. With the internet, MSMEs in Indonesia can more easily access digital platforms to compete in the global market. The internet's development has revolutionized Indonesia's education sector with access to online resources, expanding learning and training opportunities to prepare workforce skills. The Internet also facilitates digital financial services that speed up transactions and support financial inclusion, especially in areas previously underserved by financial services. The internet also provides

access to various resources and information needed for innovation. Many startups and small companies are utilizing the Internet to develop new products and services, which can boost the economy.

This study also shows that the number of Indonesian merchants positively and significantly impacts Indonesia's economy. With increasing numbers of merchants using digital payment systems such as QRIS, debit, and credit cards, transactions have become more efficient and faster. The use of cards or electronic money makes transactions faster and easier, both for merchants and consumers. This will encourage an increase in transaction frequency. Consumers tend to make transactions with greater values when using cards compared to cash. This is due to the limitations on the amount of cash carried and the perception of higher security in non-cash transactions. Ease of transaction encourages consumers to shop more often. This will increase aggregate demand and encourage economic growth. Merchants who accept non-cash payments tend to have easier access to financing from financial institutions. This allows them to develop their businesses and make investments. Using non-cash payment systems can also reduce merchants' operational costs, such as cash management costs and the risk of losing money. With a more efficient payment process, merchants can allocate more time and resources to production and marketing activities.

The labor force participation rate positively and significantly influences gross Regional Domestic Product. This study is based on other studies. This is because when more people work, more goods and services will be produced. Where this will drive the economy, an increasing labor force participation rate will indicate the increasingly optimal utilization of existing human resources. The more people who are actively working, the greater the income circulates in the community. Public consumption will increase in response to higher incomes, increasing the demand for goods and services. Increased income can also encourage people to make investments, both in the form of physical and financial investments, ultimately improving the economy.

V. Conclusion

Based on research, 99 percent of the variation in GRDP in Indonesia can be explained by the variables of the number of internet users, the number of merchants (traders) who use non-cash payment systems, and the level of labor force participation. Indonesia's gross regional domestic product is positively and significantly influenced by the number of traders, internet users, and the level of labor force participation. This shows that the increase in these three variables will also impact the increase in gross domestic product in Indonesia. The government must ensure that all regions, especially rural areas, access adequate digital infrastructure. The government can also encourage the adoption of digital technology among MSMEs and the broader community through training and incentive programs. Further research is needed to analyze the long-term and short-term impacts of digitalization and the workforce on various aspects of people's lives.

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