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THE INFLUENCE OF INVESTMENT, LABOR, AND TECHNOLOGY ON REGIONAL INCOME AND INEQUALITY

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Abstract

The purpose of this research is to analyze the effect of investment, capital expenditure, labor, and technology on GRDP per capita and income inequality in Indonesia. The analysis technique uses Structural Equation Modeling-Partial Least Square (SEM-PLS) processed with WarpPLS 8.0. The object of this research is 34 provinces in Indonesia in 2016-2022. The results showed that domestic investment, capital expenditure, labor productivity and technology, and information and communication development index positively affected GRDP per capita. Foreign investment and working population have no effect on GRDP per capita. Domestic investment and labor productivity harm income inequality. Technology, information, and communication development index positively affects income inequality. Foreign investment, capital expenditure, working population, and GRDP per capita do not affect income inequality.

Abstrak

Tujuan dari penelitian ini adalah untuk menganalisis pengaruh investasi, belanja modal, tenaga kerja, dan teknologi terhadap PDRB per kapita dan ketimpangan pendapatan di Indonesia. Teknik analisis menggunakan Structural Equation Modeling-Partial Least Square (SEM-PLS) yang diolah dengan WarpPLS 8.0. Objek penelitian ini adalah 34 provinsi di Indonesia pada tahun 2016-2022. Hasil penelitian menunjukkan bahwa penanaman modal dalam negeri, belanja modal, produktivitas tenaga kerja dan indeks pembangunan teknologi, informasi dan komunikasi berpengaruh positif terhadap PDRB per kapita. Penanaman modal asing dan penduduk yang bekerja tidak berpengaruh terhadap PDRB per kapita. Investasi dalam negeri dan produktivitas tenaga kerja berpengaruh negatif terhadap ketimpangan pendapatan. Indeks pembangunan teknologi, informasi, dan komunikasi berpengaruh positif terhadap ketimpangan pendapatan. Penanaman modal asing, belanja modal, jumlah penduduk yang bekerja, dan PDRB per kapita tidak berpengaruh terhadap ketimpangan pendapatan.

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INTRODUCTION

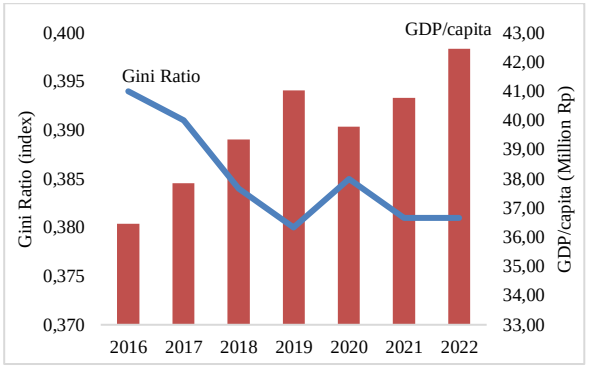
Development is a multidimensional process that includes changes in social structure, community behavior, and national institutions. In the 2020-2024 National Medium-Term Plan (RPJMN), a five-year agenda in the 2005-2025 RPJMN series, regional income inequality is one of the strategic national development issues.

Income inequality is related to the unequal income received by the community. The problem of income distribution has two main aspects, namely, how to improve the overall welfare of society and income equality (Kalalo et al., 2016). Success in handling these two aspects can be seen from the equitable distribution of income throughout the region (Rizky Permana, 2016). The Gini index measures the level of income inequality in a region's population. The value of the Gini ratio ranges from 0 to 1. A Gini ratio value close to 1 indicates that a region has a high level of inequality, while a Gini ratio value close to 0 indicates income equality.

According to Kuznets, one aspect that affects income inequality is economic growth. According to Kuznets, an increase in economic growth is consistent with a decrease in income inequality and poverty (Todaro & Smith, 2011). In this case, economic growth is projected through Gross Regional Domestic Product (GRDP) per capita. The following is a comparison graph of income inequality as measured by the Gini ratio and a graph of economic growth as measured by Gross Regional Domestic Product (GRDP) per Capita for 2016-2022.

Based on Figure 1.1, the comparison of per capita income with the level of income inequality in Indonesia in 2016-2022 shows an increase in per capita income followed by a fluctuating change in income inequality. In 2017-2019, income per capita increased, followed by a decrease in income inequality, which was getting closer to 0. In 2020, when income per capita decreased, income inequality also increased due to the COVID-19 pandemic, which had a greater impact on the poor and vulnerable. However, in 2022, the increase in per capita income was not followed by a change in income inequality or stagnation with the same Gini ratio as in 2021, which was 0,381.

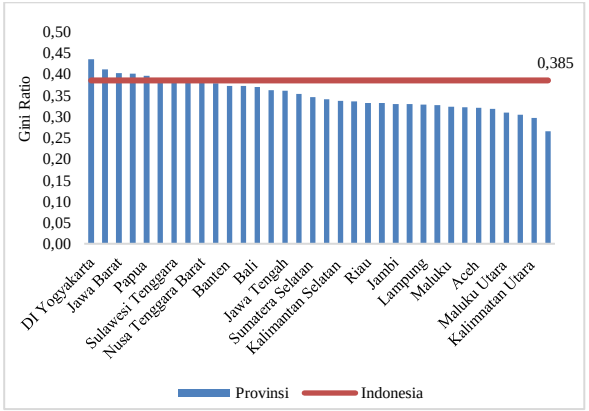
Figure 1. Gini Ratio (Index) and GDP Per Capita (Million Rupiah) Indonesia 2016-2022



Source: Central Bureau of Statistics (BPS), 2022

Although income inequality shows fluctuating changes at the national level and stabilizes in 2022, when viewed regionally at the provincial level, income inequality has different levels in each province. Some provinces have low-income inequality, and some provinces still have high inequality. This indicates that there is still an uneven gap between provinces. The following is comparative data on the average Gini ratio between provinces in Indonesia from 2016 to 2022.

Figure 2. Average Gini Ratio of 34 Provinces in Indonesia



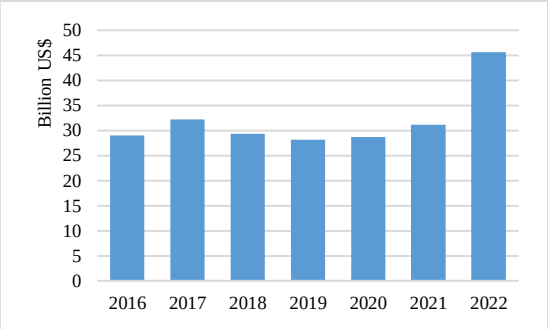
Source: Central Bureau of Statistics (BPS), 2022

Figure 2 illustrates that the Special Region of Yogyakarta (DIY) is the province with the highest level of income inequality, with a Gini ratio value of 0.436. Gini ratio values above the Indonesian average are mostly obtained by provinces in Eastern Indonesia, such as Gorontalo, Papua, South Sulawesi, and Southeast

Sulawesi. On the other hand, Bangka Belitung Islands Province has the lowest inequality level with a Gini ratio value of 0,259.

The occurrence of differences in the condition of the Gini ratio in several provinces is inseparable from several factors. One of the factors that influence it is investment. The Harrod-Domar growth theory emphasizes the role of savings and investment in determining economic growth. In addition, the Solow-Swan theory also involves capital accumulation, which, in this case, is an investment that will affect economic growth. Investment from other countries and within the country will increase employment opportunities and income, ultimately reducing inequality. The following is the Foreign Direct Investment (FDI) and domestic investment in 2016-2022.

Figure 3. Realization of Foreign Direct Investment (FDI) in Indonesia (Billion US$)

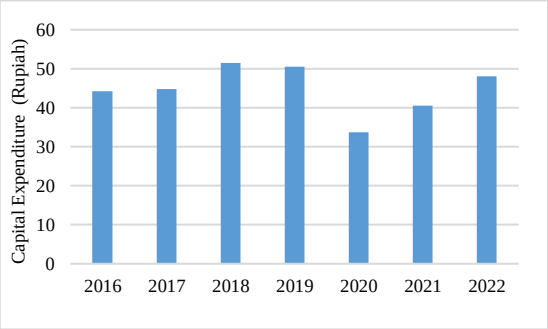


Source: Central Bureau of Statistics (BPS), 2022

In Figure 1.3, foreign investment (FDI) is developing and fluctuating. FDI experienced a decline, namely in 2019, down to 28,30 billion USD, the lowest achievement in that period. Although foreign investment decreased in 2019, the following year experienced an increase, namely in 2020, and in 2022, it increased to 31,09 billion USD. The value of domestic investment from 2016 to 2022 has increased every year. Although in 2019-2020 there was a Covid-19 pandemic, the value of domestic investment continued to increase, and in 2022, the highest acquisition was 55,28 billion USD.

According to The National Team For The Acceleration of Poverty Reduction in Wulandari & Rahmawati, (2022) explained that one of the strategic steps to overcome income inequality is accelerating government spending in both central and local governments. Keynes' theory discusses that government intervention determines that economic development can run optimally. One of the government's expenditures is capital expenditure to obtain local government fixed assets, namely equipment, buildings, infrastructure, and other fixed assets. Through capital expenditure, the government seeks to increase productivity and competitiveness (Waryanto, 2017). The development of capital expenditure in Indonesia in 2016-2022 can be seen through the following figure:

Figure 4. Capital Expenditure Realization in Indonesia 2016-2022 (Rupiah)



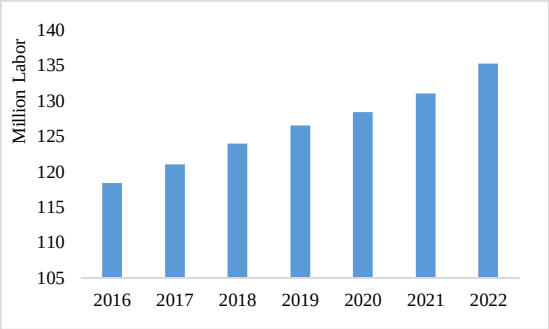
Source: Directorate General of Fiscal Balance (DJPK), 2022

The figure shows that from 2016-2018, capital expenditure increased. Capital expenditure in 2019 and 2020 decreased by Rp 33,65 trillion. The decrease in capital expenditure in 2019 was caused by a slowdown in capital expenditure, one of which was due to land acquisition that had not yet been completed. The largest proportion of capital expenditure realization was the construction of roads, irrigation, and networks. Capital expenditure is used to reconstruct, preserve, rehabilitate, and construct roads and bridges. In 2020, capital expenditure decreased due to the Covid-19 pandemic, which impacted economic activities. Capital expenditure increased in 2021 and 2022, amounting to IDR 48,13 trillion, which indicates that it is already in post-pandemic recovery and economic improvement.

Implementing capital expenditure allocated to build facilities and infrastructure requires labor so that employment opportunities will open. Labor is both an actor and a manager of production factors, so the amount of labor can positively impact increasing economic growth. The labor absorbed by economic sectors is called

the working population (Damanik et al., 2018). The characteristics of the working population are where someone will earn or help earn income, profits, or wages by working. The following is the development of the working population in Indonesia in 2016-2022.

Figure 5. Number of Working Population in Indonesia 2016-2022 (Million Labor)

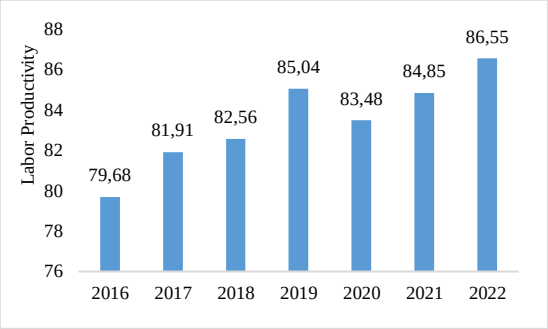


Source: Central Bureau of Statistics (BPS), 2022.

The condition of the working population (workers) has increased every year. Although 2019 the COVID-19 pandemic occurred in 2020, the number of working people still increased to 12,8 million. Furthermore, in 2021, workers increased by 131,05 million people; in 2022, they increased by 135,2 million people because they were already recovering after the pandemic.

Labor productivity is one of the measures of the efficiency and effectiveness of the use of labor in producing goods and services. Labor productivity describes the amount of output each worker can produce during a certain period. Labor productivity is calculated by dividing the total output by the total number of workers. Increasing labor productivity is an important factor in creating economic growth, as productivity reflects efficiency and technological development (Mankiw, 2006). The development of Indonesia's labor productivity from 2016 to 2022 can be seen in the following figure. Productivity is one of the measures of the efficiency and effectiveness of the use of labor in producing goods and services. Labor productivity describes the amount of output each worker can produce during a certain period. Increasing labor productivity is important in creating economic growth, as productivity reflects efficiency and technological development (Mankiw, 2006). The development of Indonesia's labor productivity from 2016 to 2022 can be seen in the following figure.

Figure 6. Indonesian Labor Productivity 2016-2022 (Million per Labor)



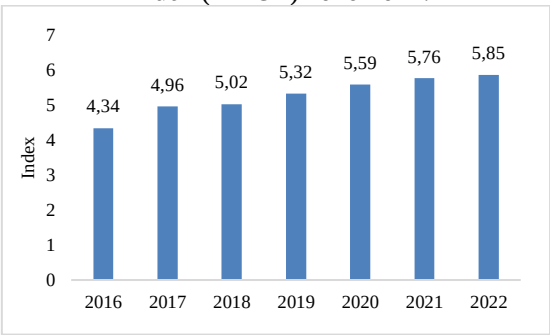
Source: Central Bureau of Statistics (BPS),2022

Figure 6 shows the fluctuating development of labor productivity in Indonesia. There was an increasing trend from 2016-2019 to Rp 85,04 million per labor. In 2020, labor productivity decreased to IDR 83,48 million per worker due to the global COVID-19 pandemic, which impacted all economic activities. There is a social restriction policy so that many workers work from home, and many companies or industrial sectors lay off workers, which ultimately affects the decline in labor productivity. Furthermore, from 2021 to 2022, labor productivity increased again because of the recovery from the pandemic, and economic activities began to return to normal.

Apart from capital accumulation (investment) and labor, technological progress is one of the factors considered capable of driving economic growth. Technological progress is an important component because it can be interpreted as the increasing application of new scientific knowledge in the form of findings and innovations regarding physical capital and human capital (Kamilla et al., 2021). Based on the Solow-Swan theory explains that economic growth is driven by an increase in factors of production (population, labor, capital accumulation) and technological development. One measure to assess ICT development in Indonesia is the Information and Communication Technology Development Index, which plays an important role in ICT development in a region. It aims to measure the digital divide between regions and the growth of ICT development. The

development of IP-ICT in Indonesia is explained in the following figure.

Figure 7. Indonesia's Information and Communication Technology Development Index (IP-ICT) 2016-2022.



Source: Central Bureau of Statistics (BPS), 2022.

Figure 7 shows that the development of IP-ICT is increasing every year. Although 2020 Indonesia experienced a COVID-19 pandemic, IP-ICT increased to 5.59 from the previous year, 2019, with an achievement of 5.32. The increased IP-ICT during the pandemic is due to the social restriction policy. In 2021 and 2020, IP-ICT continued to increase, which means that technology is advancing in terms of infrastructure and expertise in using technology.

This study uses previous research as a reference, which, of course, differs from previous studies. Wijayanti et al. (2023) Their research used independent variables of investment, labor force, and information and communication technology (IP-ICT), but this study did not use the labor force variable. Effendy & Djohan, (2022) used two structural equation models with the path analysis method. Still, in this study, two structural models were used with the SEM-PLS (Structural Equation Modeling-Partial Least Square) analysis method, which was processed using WarpPLS 8.0.

RESEARCH METHODS

The data used in this research is secondary data in the form of panel data. The data in this study came from the Central Statistics Agency (BPS), the Directorate General of Fiscal Balance, and several books, journals, and literature related to this research. The analysis technique uses Structural Equation Modeling-Partial Least Square (SEM-PLS), processed with WarpPLS 8.0. The object of this research is 34 provinces in Indonesia in 2016-2022. The variables used in this study are the dependent variables (Y2) in the form of Income Inequality and (Y1) GRDP Per Capita. Independent variables (X) include Foreign Investment (FDI), Domestic Investment (DI), Capital Expenditure, Working Population (workers), and Labor Productivity and Information and Communication Technology Development Index (IP-ICT). This study uses a structural model that can be written as follows:

$$GDRPcap = \Gamma FI + \Gamma DI + \Gamma CE + \Gamma Workers + \Gamma LP + \Gamma ICTDI + \varsigma 1 \quad (1)$$

$$Ineq = \beta\, GDRPcap - \Gamma FI - \Gamma DI - \Gamma CE - \Gamma Workers - \Gamma LP + \Gamma ICTDI + \varsigma 2 \quad (2)$$

Description:

GDRPcap	: GRDP per capita
Ineq	: Income inequality
β	: Path coefficient of endogenous latent variable to endogenous
Γ	: Path coefficient of exogenous latent variable on exogenous
ς	: Residual
FI	: Foreign capital investment
DI	: Domestic investment
CE	: Capital Expenditure
Workers	: Working Population
LP	: Labor Productivity
ICT	: Information and Communication Technology Development Index

RESULTS AND DISCUSSION

This research analyzed the direct and indirect effects between latent variables so complex models can be tested together in one model using SEM-PLS. SEM-PLS has 2 model evaluation processes, the outer and inner models.

Measurement Model

The significance value of the outer weight or p-values of the FI, DI, CE, Workers, LP, ICT, GDRPcap, and Ineq indicators is <0.001. The p-values < 0.001 are smaller than the significance level of 5% or < 0.005, which means that the PMA indicators significantly compose or form the latent construct of FI, DI, CE, Workers, LP, ICT, GDRPcap, Ineq.

Table 1. Indicator Weight

Indikator	Outer Weight	P-values
FI	1,000	< 0,001
DI	1,000	< 0,001
CE	1,000	< 0,001
Workers	1,000	< 0,001
LP	1,000	< 0,001
ICT	1,000	< 0,001
GDRPcap	1,000	< 0,001
Ineq	1,000	< 0,001

Source: Output WarpPLS 8.0

Multicollinearity test

Indicators are said not to be subject to multicollinearity problems if the VIF value is <5 (Hair et al., 2023). However, some experts believe that the VIF value is < 10. The table shows that the VIF value is 0.000 or < 5, so it can be concluded that there is no collinearity between latent constructs or no multicollinearity problem.

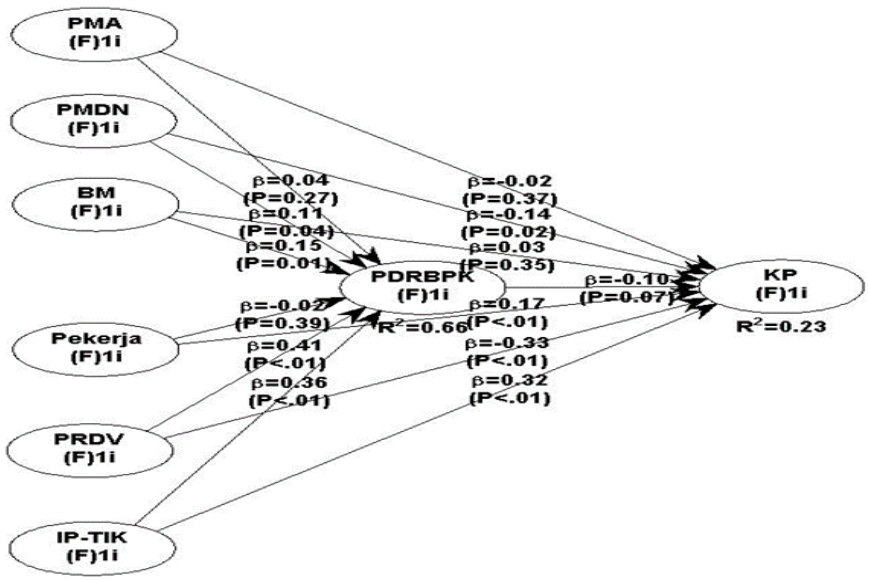
Table 2. VIF Value

Variabel	Nilai VIF
FI	0,000
DI	0,000
CE	0,000
Workers	0,000
LP	0,000
GDRPcap	0,000
KP	0,000

Source: Output WarpPLS 8.0

Inner Model

Figure 8. Chart of SEM-PLS Analysis Results



Source: Output WarpPLS 8.0

GDRPcap = 0,039FI + 0,109DI + 0,146CE – 0,018Workers + 0,407LP + 0,365ICT+ ς_1

Ineq = -0,096GDRPcap – 0,021FI – 0,137DI + 0,025BM + 0,175Workers – 0,33LP+ 0,318ICT + ς_2

Based on the data processing results using the SEM-PLS method, foreign investment has a coefficient of 0.039 with a p-value of 0.274, where the p-value is greater than the significance level of 0.05. Foreign investment did not affect the GRDP per capita of 34 provinces in Indonesia in 2016-2022. These results do not align with the Harrod-Domar theory, which explains that investment drives economic growth. This research is in line with research conducted by Nadzir and Setyaningrum Kenda (2023), Shabbir et al (2021) and Ahmed & Omorse (2016) with the results of FI being insignificant in economic growth. Najmi, Adi and Zulha (2022), Ridwan and Huda (2022) state that foreign investment reduces GDP per

capita. The decline in GRDP per capita is due to foreign investment that has been realized not being on target, so it has not been able to maximally boost GRDP per capita.

Domestic investment positively affects GDP per capita in 34 provinces in Indonesia. DI has a coefficient of 0.109 with a p-value of 0.045, which is smaller than 0.05. This agrees with the Harrod-Domar Domar theory, which explains that investment drives economic growth. This research aligns with Mahriza and Amar B. (2019), which shows that domestic investment positively affects economic growth. Apart from that, Fuad (2018) and A. Fitriadi Al Akbar also show that domestic investment positively affects economic growth.

Capital expenditure obtained a coefficient value of 0.146 and a p-value of 0.011, less than 0.05. So, it can be concluded that the BM variable positively affects GRDP per capita. The results of this research are in accordance with Keynesian theory, which discusses how the economic role of government influences growth. Pubra, (2019) shows that capital expenditure positively and significantly affects GRDP per capita in Riau Province. Research by Aghniya *et al.*, (2016) and Priambodo and Hidayat, (2020) also shows that capital expenditure has a positive influence on GRDP per capita. The benefits of capital expenditure must be maximized to achieve value for money, which has implications for improving the economy.

Based on the data processing results using the SEM-PLS method, the working population (workers) has no effect on GRDP per capita in 34 provinces in Indonesia. The coefficient value obtained is -0.018, and the p-value is 0.393, greater than 0.05. This research does not align with the Neo-Classical Solow-Swan Growth theory, which states that economic growth depends on population growth, capital accumulation, technological progress, and the size of output, which are interrelated. Research that supports this research is Damanik, Zulgani and Rosmeli, (2018) which explains that the number of working people does not affect economic growth. Effendy and Djohan, (2022) explained that the number of working people does not affect economic growth in East Kalimantan. This is caused by the uncertain global market situation, which has an impact on the decline in energy source commodities, so the labor sector is not yet stable, which causes insufficient labor to be absorbed.

Labor productivity positively affects GDP per capita in 34 provinces in Indonesia. Labor productivity obtained a coefficient value of 0.407 and a p-value of <0.001, less than 0.05. The results of this research are in line with research by Desnasari, (2020) that labor productivity positively affected the economic growth of 34 provinces in Indonesia in 2009-2018. Productivity is the power to produce goods and services. Increasing productivity can also impact living standards through increasing output to increase income and economic growth. Ratnasari and Yuliarni, (2021) their research showed that labor productivity positively affected per capita income.

The Information and Communication Technology Development Index positively affects GDRP per capita in 34 provinces in Indonesia. The output from WarpPLS explains that IP-TIK has a coefficient of 0.365 with p-values < 0.001 greater than 0.05. This research is in accordance with the neo-classical growth theory by Robert Solow, which suggests the existence of labor and technology in the economic growth equation. Almizan, (2020) and Libraningrum and Santoso, (2023) which shows that ICT has a positive effect on GRDP per capita. The greater interaction and adoption of ICT will be useful for encouraging additional productivity, which will trigger economic growth.

Foreign Direct Investment has a coefficient of -0.021 and a p-value of 0.373, greater than 0.05. This shows that FI does not affect income inequality in 34 provinces in Indonesia. In Harrod-Domar's view, capital investment carried out in a region can have a labor absorption effect, increasing employment opportunities for the community so that income distribution and community income can increase. Research by Laut et al., (2020), Pinilih, (2021), Royan et al., (2019) and Pauzi & Budiana, (2016) which explains that foreign investment does not affect income inequality. Laut et al., (2020) in their research explained that there is no influence of FDI on income inequality because foreign investors tend to be interested in investing their capital in areas with high per capita income.

Domestic investment has a coefficient of -0.137 with a p-value of 0.016, smaller than 0.05. From these results, it is concluded that DI has a negative effect on income inequality. Another researcher in line with this research is Pinilih (2021), states that DI negatively influences income inequality. Increasing DI will reduce income inequality. Research from Hartini (2017) states that increasing DI will reduce income inequality. Increased investment in an area will increase per capita income due to productive activities.

The results from WarpPLS show that capital expenditure has a coefficient value of 0.025 and a p-value of 0.347, more than 0.05. So, it can be concluded that the capital expenditure variable does not have a negative effect on income inequality. This research is supported by research by Yasni & Yulianto, (2020) where capital expenditure has a positive effect on income inequality, which means that an increase in capital expenditure will increase income inequality. Kiak, (2020) shows the positive influence of capital expenditure on income inequality. Capital expenditure allocated for infrastructure in regions during the development period has not seen any benefits for the community's economy; therefore, there has not been an equal income distribution in these regions.

The working population (workers) does not affect income inequality in 34 provinces in Indonesia. Workers have a coefficient value of 0.175 and a p-value of 0.003, which is smaller than 0.05. The results of this research are in line with research by Damanik et al., (2018) where the number of working people positively affects income inequality in Jambi Province. In other words, the increasing population will increase the income inequality in Jambi Province. Apart from that, the results of research by Adipuryanti & Sudibia, (2015) show that the working population does not affect income inequality.

Labor productivity has a coefficient of -0.334 and a p-value of <0.001, less than 0.05. So, it can be concluded that the labor productivity variable has a negative effect on income inequality. This research is in line with research by Wibowo & Pangestuty, (2023) which shows that labor productivity negatively correlates with income inequality in Indonesia. When productivity increases, this condition can affect its selling power in the sense that the wages received will increase Maulina & Andriyani, (2020).

ICT has a coefficient of 0.318 with p-values < 0.001, which is smaller than 0.05. From these results, it is concluded that ICT positively affects income inequality. The results of this research have a positive coefficient, which means inequality has increased. This condition shows that Indonesia is in the initial phase of growth based on Kuznet theory, where increasing ICT, which reflects increasingly advanced technology, will increase the technological gap so that it has an impact on increasing income inequality. The results of this research are in line with research conducted by Fuady, (2018) which explains that information and communication technology (ICT) positively correlates with income inequality. This is because ICT advances are enjoyed more by high-income people, not low-income groups. Research by Afzal et al., (2022) suggests that ICT development has the potential to increase income inequality. The development of ICT is considered to worsen inequality in income distribution because its benefits are felt more by people with high incomes and large industries.

GRDP per capita has a coefficient of -0.096 with p-values of 0.066, more than 0.05. This means that GRDP per capita does not affect income inequality in 34 provinces in Indonesia. The results of this research have a negative coefficient, which means it affects reducing income inequality. Based on Kuznets' theory, decreasing income inequality reflects Indonesia's condition in a long-term phase, where increasing economic growth impacts reducing income inequality. Research by Suhendra & Wicaksono, (2020) and Febriyani & Anis, (2021) in their research explains that there is a negative and insignificant coefficient of economic growth on income inequality. This can happen because high economic growth is not yet an answer to efforts to reduce income inequality and inadequate labor absorption.

CONCLUSION

The research results show that Domestic Investment, capital expenditure, labor productivity, and the Technology, Information, and Communication Development index positively affect GDRP per capita. Foreign

Direct Investment and the working population (workers) do not affect GRDP per capita. Domestic Investment and labor productivity have a negative effect on income inequality. The Technology, Information, and Communication Development Index positively affects income inequality. Foreign investment, capital expenditure, working population (workers), and GRDP per capita do not affect income inequality.

The policies that can be implemented are improving the bureaucracy and maintaining the domestic investment climate. Capital expenditure realization must remain targeted. Workers are given debriefing to improve their quality of work. Increasing labor productivity and equitable development of information and communication technology in all provinces in Indonesia.

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