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Uncovering of productivity and wages_An evidence from Indonesia

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Abstract

Productivity plays an important role towards inclusive economic development in a country. Improvements in productivity, competitiveness, living standards, and economic development encourage policymakers to accelerate fair development. The premise of this study aims to investigate the factors that influence labor productivity in an emerging market, such as Indonesia. This work is supported by quantitative and verification methods. Panel data collection uses secondary publications throughout 2016–2023 compiled from reports from the government institution. Then, the data is processed and interpreted based on the Ordinary Least Square (OLS) and Generalized Least Squares (GLS) approach. The output of the study illustrates that the increasing wage inequality, average length of schooling, economic growth in the primary sector, economic growth in the secondary sector, and economic growth in the tertiary sector increase labor productivity in Indonesia. From this study, the four variables have proven their respective contributions which have a significant impact on stimulating labor productivity in the long term. In the context of broadening scientific horizons, strategies for future discussion directions consider aspects beyond wage inequality, average years of schooling, economic growth, and labor productivity. In the dimension of novelty, this paper also complements previous publications, where the highlighted case studies are district and city data in Indonesia.

Key-words: Labor productivity, wage inequality, length of schooling, economic growth, OLS, GLS, panel data

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1. Introduction

In the perspective of effectiveness, the essence of productivity is the production process that converts inputs into outputs ^[1]. By improving productivity, competitiveness and living standards, the welfare level of the country can be increased ^[2]. In the long term, productivity is also a leverage that plays a role in growing the domestic economy ^[3]. Productivity convergence is vital on a national and regional scale ^[4]. The ASEAN Secretariat ^[5] reports that labor productivity in Indonesia is still lower than other ASEAN nations, such as Singapore and Malaysia. Implicitly, this polemic shows that the competitiveness of the Indonesian state is below the average of the two nations. Besides, the weak level of productivity also hampers the acceleration of economic development, so that many nations are now competing to spur their productivity. In addition, a database related to labor productivity can make it easier for stakeholders to realize a more precise development plan. At the same time, the process of collecting labor data at the regional, regional level also helps local governments to identify the performance of each region in managing the potential of human resources ^[3].

Figure 1 informs the level of labor productivity in the top-6 in ASEAN for 18 periods. The data above converts productivity in US\$. From 2000 to 2018, the trend of labor productivity from Singapore was superior to the other five nations in ASEAN. Malaysia

ranks 2nd, even though there is a big gap between Malaysia and Singapore. After that, Thailand actually ranked in 3rd place, Indonesia (4th), the Philippines (5th), and Vietnam (6th). Uniquely, the characteristics of employment in Indonesia are supported by the pattern of labor and the composition of the population that is expansive compared to the other five countries in ASEAN.

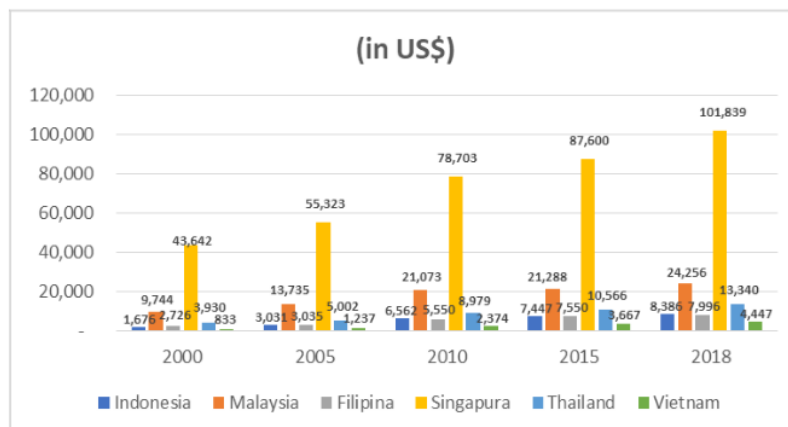


Fig. 1: Productivity of nations in ASEAN from 2000, 2005, 2010, 2015, and 2018
Source: The ASEAN Secretariat [5].

The publications, highlighted by Strauss and Wohar [6] emphasize that labor productivity is determined by several dimensions, including wages. Yet, when increasing wages, the consequence is to create wage inequality, so that the nominal increase has a relatively negative impact on productivity. In line with that, in the theory of "efficiency wages", it is explained that the improvement of workers' wage contracts, can simulate an increase in labor productivity which is built by revitalizing worker health, worker turnover, worker effort, and worker quality [7-8]. The level of education or synonymous with "human capital", as a combination of education, experience, skills training, habits, health, energy, and initiative in the personality abilities of workers Mankiw [7], Romer [9], and Sugiharti *et al* [10] focuses on education in the fundamental basis of labor productivity in assessing the ability of each worker to absorb modern technology and channel his capacity in the capacity to develop his productivity [11]. Technically, according to Wijaya *et al* [12], output growth such as: demographic pressures that lead to competition and employment, happiness, and human development reflecting the quality of education, welfare (per capita income), and health services, also determine productivity. [27]

In a study, Blanchard and Johnson [13] explained that output growth has a positive impact on productivity. Both of these relationships are moving in a systematic direction, generally the intensity of output is greater than productivity growth. In the short run, the causality from output growth to productivity growth implies higher output oriented towards higher productivity. This situation represents when an industry or company accumulates labor and uses more workers than the current standard of production. If the demand for goods increases for any reason, some producers respond by adding jobs and some forcing workers to work harder through certain schemes, so that an increase in output can increase productivity. On the other hand, Dieppe [14] explains that economic growth has a positive effect on increasing productivity. Such conditions are triggered by sectoral relocations or shifts in the structure of the economy, including labor productivity.

This paper focuses more on productivity that is bridged by. The reason is that wage increases tend to be related to labor productivity in a nation ^[2]. In fact, countries that implement high labor wage regulations have relatively higher productivity. This is in contrast to countries that apply low levels of worker wages, such as Indonesia, where the characteristics of lower wages are lower. The nominal wage realization is different when compared to the conditions of workers from Malaysia and Singapore. In other words, the level of productivity in Indonesia is far behind those of the two nations ^[15]. In the composition of the labor market in developing markets, the relationship between productivity and wages is difficult to separate. Labor productivity is determined by the size of wages. The increase in wage receipts leads to an increase in the effort and motivation of workers ^[16–20]. Furthermore, this study discusses wage inequality between workers, which is the main problem in the value of worker productivity. In some literatures, it is found that the distribution of wages for workers in the industrial sector has succeeded in increasing productivity, so that the alignment of wage differences has a positive effect on output and productivity growth ^[21]. Policardo *et al* ^[22] concludes that the increase in wages has led to wide wage inequality, which in fact has a negative effect on workers' efforts towards productivity. The above conditions are caused by differences in wages and creates injustice among workers. Thus, the motivation of workers is relatively decreased. From this gap, a detailed division of work technical, operational compensation, remuneration characteristics, and wage eligibility arrangements is required.

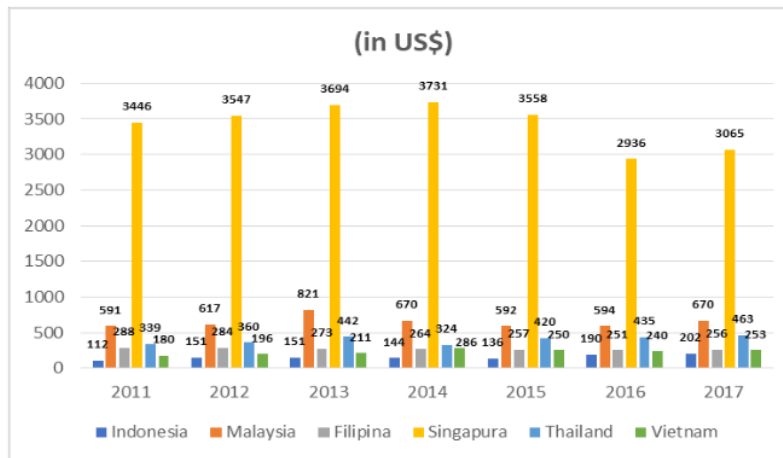


Fig. 2: Average wages per month in ASEAN, 2011–2017
 Source: The ASEAN Secretariat ^[5].

Figure 2 compares the average monthly wage rate on the ASEAN scale. In 2011–2017, we compare 6 upper-middle-income nations in ASEAN. Interestingly, Singapore is in the 1st position in ensuring the eligibility of workers' wages. This is very different from the case in Indonesia (position 6), where collectively groups of workers receive substandard wages. In a prominent lens, Malaysia (position 2), Thailand (position 3), and Vietnam (position 4) focus on a better wage system for workers than the Philippines (position 5) whose average monthly wage rating is not much different from Indonesia. Furthermore, Levine ^[23] claims that an increase in the wages of the lower class, can increase domestic output as long as the increase in labor costs balances the productivity ratio. The issue of wage inequality was understood by Caroli and van Reenen ^[24] who investigated that a

striking salary ratio between skilled workers and unskilled workers would have a negative effect on organizational settings. In turn, making productivity growth decline drastically. On another perspective, it is assumed that the optimal wage structure is related to equity and cohesiveness that maximizes productivity, where wage inequality has implications for the efforts of individual workers in determining output ^[23, 25-26].

Arguments disputing the gaps in labor productivity across several sample countries are highlighted. In the literature related to wage policies, improving education, and economic development as an effort to boost labor productivity is discussed. From before published observations from Israel, explaining differences in labor productivity by dual duality emphasizes the contribution of education to increasing human capital, so that an increase in human capital allows an increase in output per worker ^[27]. The levels of labor productivity across the various categories of workers in the U.S and Brazil are striking. The difference that stands out between the two countries is the economic cycle that brings wage imbalances to certain groups of workers ^[28]. In Pakistan, it was found that the opposite trend was found between unskilled labor and worker productivity, which triggered fluctuations in the welfare of workers in the lower-middle-upper class ^[29]. Too, skilled workers have educational classifications and expertise certificates that are relevant to job standards. The debate, which refers to the contribution of the three elements above, is also highlighted in Belgium, where the labor market situation of workers with low education is very critical. There is a misalignment between the difference in the cost of wages and education, resulting in weak productivity gains. On the one hand, the poor of company profits also hampers the Belgian economy ^[30]. van Biesebroeck ^[31] suggests that the wage ratio in developing markets is calculated systematically using the labor productivity formula. Understanding this complex condition, it is also recommended that a wide educational gap can be combined via a competitive labor market that must be differentiated on marginal space, hiring restrictions, working hours, and worker performance.

Thus, wage inequality is a stimulus for worker productivity. On the other hand, at the enterprise level, Becker ^[32] is concerned with the growing wage inequality, which reduces incentives to invest in education. In the long term, it certainly has a negative impact on productivity growth. Finally, when workers feel less valued, they tend to reduce their competence and workload ^[33-35]. Referring to the premise above, this research inspires and distributes information about the positive and negative impacts of increasing wages as a productivity controller. Research motivation is to assist the government in pursuing competitiveness, potential, worker welfare, and contributing to accelerated growth and more impressive economic development.

2. Review of literature

In identifying the factors that affect productivity, based on theoretical logic, including the Hwang ^[36] study which modifies the productivity variable in the topic of increasing wages, thus creating wage equality. The transition is in line with the "efficiency wage theory". Examining broadly, although productivity is contemporary, it makes sense to include educational variables. In line with the "human capital theory", that reforms in workforce education can transform labor productivity ^[37]. Specifically, "Gross Domestic Product (GDP) growth theory", especially in the regional scope, *i.e.* Gross Regional Domestic Product (GRDP), rests on the argument of Blanchard and Johnson ^[13], where soaring output growth is positively correlated to productivity growth. Then, in "expectancy theory", it is interpreted that the strength or tendency to act, depends on the strength of hope. It represents any human behavior followed by a certain output and

changes the attractiveness of the output. As geopolitical stability and economic growth improve, individuals seek to increase their output, so the increase stimulates the bargaining power of labor and wages. In line with this scenario, Ostapenko ^[38], Atesoglu and Smithin ^[39], Korkmaz and Korkmaz ^[40], as well as Gavurova *et al* ^[41] illustrates that increasing economic growth encourages positive labor productivity.

The health status of the workforce is also an urgency for regional sustainability. Rahman ^[42] predicts that household status and individual characteristics as measured in per capita burden (gender, age, and number of household members) and expenditure groups include: education services and drinking water consumption have a significant effect on the health level of workers in urban areas-rural areas in East Kalimantan, Indonesia. Tampubolon *et al* ^[43] calculate that the determination of the minimum wage in the manufacturing sector in Indonesia is highlighted by the role of labor unions, which is more intensively highlighted.

Brill *et al* ^[44] and the Organization for Economic Co-operation and Development (OECD) ^[45] identified wage gaps in labor productivity at the global level. Besides to monitoring real wages, factors affecting the aggressiveness of labor productivity include skills, capital investment and technological sophistication. All these references are adjusted to the use of production inputs. Public policies that guarantee an inclusive economy are an important determinant of ensuring productivity-to-wage reforms are spread across enterprises. At the same time, an increase in working capital, such as transmission in education that is disproportionate to wage levels, poses a risk to less competitive competition ^[46-49]. In the end, regulations related to labor protection conflict with economic progress. van Ark *et al* ^[50] proposed a competitive advantage approach in realizing technological progress, productivity and innovation in the direction of higher economic output in countries that are members of the European Union. Another idea from Zulu and Banda ^[51], in South Africa and Mauritius, indicates that labor productivity is correlated with economic growth and vice versa. The cumulative effect of employment in the industrial sector stimulated significantly output growth in both countries. As another theoretical comparison, during the pre-crisis and post-crisis periods in global markets, labor productivity trends were severe with implications for competitiveness. For example, in Lithuania, Latvia and Estonia, the phase of economic growth actually weakened due to increased productivity ^[52]. Hernández and Székely ^[53] concluded that the key to macroeconomic regulation that is most appropriate for overcoming poverty is productivity coupled with Mexico's massive economic growth. Labor productivity can determine changes in the wage bill adjusted to the level of employment, which in turn will support GDP. With the label of rapid economic growth, it also affects the provision of social spending, which is closely related to the poverty line. Robust long-term economic growth creates positive labor productivity values ^[54]. The basic foundation of building productivity is human capital. Human capital obtained from insight knowledge. The second is economic determination. The scale of industrial growth is usually technically connected to the production function, one of which is wage control.

The basic conception that is different from previous studies lies in this paper which calculates the effect of wage inequality at the provincial level in Indonesia. Finally, this study also includes indicators related to the growth of the main sectors (primary, secondary, and tertiary) that indicate labor productivity.

3. Materials and methods

This study dedicates and focuses on the effect of wage inequality, average length of schooling, primary sector economic growth, secondary sector economic growth, and

tertiary sector economic growth on labor productivity. The data processing material is in the form of quantitative-verification. Time-series database obtained from Central Bureau of Statistics (BPS) Indonesia [55], tabulated into eight periods (2016–2023). Figure 3 below describes the methodological process. Steps one through four include: collecting data, processing data, inputting data via a statistical program, and finally concluding a hypothesis.



Fig. 3: Workflow
Source: Own.

Panel data interpretation is compiled from all provinces in Indonesia and processed using Ordinary Least Square (OLS) and Generalized Least Squares (GLS) techniques. Then, it is entered into special software called Eviews. Special parameters on the economic growth variable are converted into three types of GRDP: primary, secondary, and tertiary, while wage inequality is represented by the Gini coefficient. In detail, the mathematical equation is formulated as follows:

$$\text{LnLP} = \alpha_0 + \alpha_1 \text{Gini}_{it} + \alpha_2 \text{ALS}_{it} + \alpha_3 \text{LnGRDP_PS}_{it} + \alpha_4 \text{LnGRDP_SS}_{it} + \alpha_5 \text{LnGRDP_TS}_{it} + e_{it} \quad (1)$$

Where: Ln = Logarithm, α_0 = Constant, α_i = Regression coefficient of each variable in the long run, LnLP_{it} = Labor productivity, Gini_{it} = Wage inequality, ALS_{it} = Average length of schooling, LnGRDP_PS_{it} = Gross Regional Domestic Product of the primary sector, LnGRDP_SS_{it} = Gross Regional Domestic Product of the secondary sector, LnGRDP_TS_{it} = Gross Regional Domestic Product of the tertiary sector, e_{it} = Error term, i = Province ($i = 1, 2, \dots, 33$), and t = Period (2016–2023).

4. Results & Discussion

In this regression, statistical criteria related to variable data must meet the assumptions of autocorrelation, normality, and heteroscedasticity. Of the three assumptions, each has different requirements, but their essence is interrelated. In the autocorrelation test, the data is in the form of structures implied by the Breusch-Godfrey test. Using the Lagrange Multiplier score, the Chi-Square probability is below 5% ($0.000 < 0.05$), so it is concluded that there is no autocorrelation problem (see Table 1). The second classic assumption is data normality. Using 297 samples, the Jarque-Bera test proves that the residuals are not normally distributed, where the probability is 0.026 ($p < 0.05$). Figure 4 implies the normality of the residuals in the research model. On the assumption of heteroscedasticity via the Breusch Pagan Godfrey test, it shows that the probability of Chi Square in Obs*R-

Squared is 0.000 or below 5% ($\rho < 0.05$). Thus, Table 2 concludes that the regression model is homoscedasticity or categorized in heteroscedasticity.

Table 1: Output of autocorrelation

Items	Value
F-statistic	375.14
Obs*R-squared	214.41
Prob. F(2,289)	0.000
Prob. Chi-Square(2)	0.000

Source: Computing with Eviews.

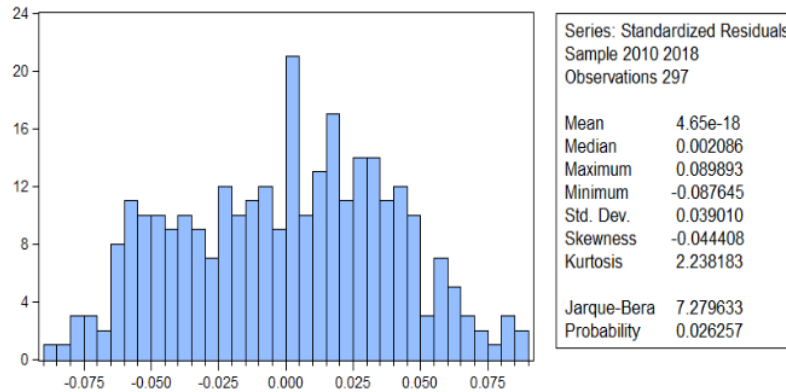


Fig. 4: Output of normality

Source: Computing with Eviews.

In principle, research objectives are evaluated using OLS and GLS techniques. Table 3 summarizes the regression results of the five independent variables on the dependent variable (labor productivity) in Indonesia during 2016–2023. The simultaneous relationship between wage levels, average length of schooling, GRDP of primary sector, GRDP of secondary sector, and GRDP of tertiary sector has a positive effect. This is showed by a positive F-statistic score (1916.583), where every increase in the five components of the independent variable affects labor productivity in Indonesia. With a negative constant score (-4.075) and probability ($p = 0.000$ or $\rho < 0.005$), even though there is a significant relationship between the average length of schooling, GRDP of the primary sector, GRDP of the secondary sector, and GRDP of the tertiary sector with labor productivity, but the more these five variables increase every point, it actually decreases the growth of labor productivity in the short term by 4.075%.

Table 2: Output of heteroscedasticity

Items	Value
F-statistic	7.755
Obs*R-squared	34.92
Scaled explained SS	45.584
Prob. F(5,291)	0.000
Prob. Chi-Square(5)	0.000

Source: Computing with Eviews.

As an illustration, Table 3 also confirms that there is a partial relationship and long-term effect between wage levels, average years of schooling, GRDP of primary sector, GRDP of secondary sector, and GRDP of tertiary sector on labor productivity in Indonesia. In essence, at a degree of 10% ($\rho < 0.1$), wage increases have a significant effect on labor productivity, where with a positive coefficient (0.135) and probability ($\rho = 0.501$), automatic wage policies increase labor productivity partially reaching 0.135%. With a significance of 1% ($\rho > 0.001$), another significant partial causality was also shown by the average length of schooling, GRDP of primary sector, GRDP of secondary sector, and GRDP of tertiary sector. In the long term, the increase in these three variables has a positive impact on labor productivity. Every time the average length of schooling, GRDP of primary sector, GRDP of secondary sector, and GRDP of tertiary sector increases by 1 point, labor productivity increases to 0.037, 0.342, 0.175, and 0.179.

Table 3: Output of regression

Variables	Beta Coefficient	Prob.
Constant	-4.075	0.000**
Wages (Gini)	0.135	0.501*
Average length of school	0.037	0.000***
GRDP of primary sector	0.342	0.000***
GRDP of secondary sector	0.175	0.000***
GRDP of tertiary sector	0.179	0.000***
Adjusted R-squared: 0.995		
R Square: 0.996		
F-statistics: 1916.583		

Source: Computing with Eviews; *Noted:* *p <10%, **p <5%, dan *** p <1%.

However, wages that create an increase in wage inequality between workers indicate that worker productivity in Indonesia is classified as not yet maximized. Kurniawan *et al* ^[56] shows that chaos in low wage management creates turmoil between skilled workers with high education and unskilled workers with low education, causing a decrease in motivation and productivity. Considering the empirical facts in this study, the striking difference in wages of workers will motivate skilled workers to be more productive. But, unskilled workers who receive wages below standard or lower, feel unfair, even though the logical reason for the company is that it depends on the type of work, field, certain position, and skill ability.

As is the case in several large cities in the U.S, Portugal, and UK, the increase in worker wages also widens the disparity, where highly educated workers sometimes receive nominal wages that are not much different or sometimes smaller than those who are not educated ^[57-60]. Currently, employment only considers the level of productivity and not on educational background ^[61-63]. Broadly speaking, companies also adopt a lot of technological sophistication in production machines, thereby slowly reducing human workers ^[64-65].

The trend is contrary to the publications of Policardo *et al* ^[22], explains that the wage inequality contained in the Gini index actually has a negative effect on worker productivity. The existence of this condition is triggered by a group of developed countries that have skilled workers who starting unfair wage premiums among workers. This complexity hinders the motivation of workers, which tends to limit productivity.

Competence, as measured by educational qualifications (mean length of schooling), is consistent with "Human Capital Theory" which implies that human capital is a fundamental source of productivity ^[9]. Human capital is a combination of certification of

education, experience, training, skills, habits, health, energy, and initiatives that affect human productivity^[81]. Competencies resulting from education, will empower workers' knowledge, skills, competencies, efficiency, effectiveness, mastery of technology, and side by side with knowledge assimilation, so that they are beneficial to productivity. Since these two decades, Arbache and Sarquis^[66], Chevalier *et al*^[67], Rukumnuykit and Pholphirul^[68], Kampelmann *et al*^[69], as well as McDonald and Roberts^[70] describe that education can increase labor productivity. Learning from experience in several countries, increasing the level of education, can control the abilities and skills of workers.

Regression coefficients on primary, secondary, and tertiary GDP variables with positive signs were verified by Atesoglu and Smithin^[39], Korkmaz and Korkmaz^[40], and Gavurova *et al*^[41] which confirms that economic growth has a positive effect on increasing productivity. In "expectancy theory", the tendency to react depends on the strength of the expectation, where an action is followed by a certain output and is based on the attractiveness of business actors. Ideally, developments in the economic structure provide a multiplier effect for other sectors that empower workers who accumulate knowledge and skills according to the demands of civilization. Surprisingly, a positive economy brings a conducive business climate to achieve exclusive profits. Finally, producers seek to boost output capacity characterized by labor productivity. Therefore, government policy instruments control the creation of integrated economic growth, partner with harmonious business actors, improve informal institutions, implement formal institutions in the business world, and control monetary policy to create connectivity among stakeholders. Several cases of countries that are equal to Indonesia in the labor market reflect productivity and wages compared. Policardo *et al*^[71] evaluated the wage inequality on labor productivity of developing countries in the OECD. In parallel, wage inequality represents low labor productivity. From this moment, Bağlıtaş^[72] colored a valuable discovery about the unfair distribution of income, which does not benefit employees. Specifically, among thirty one countries in Europe, wage inequality has undermined labor productivity. Furthermore, the accelerating volume of trade in developing countries will actually lead to more destructive wage inequality. In recent years, trade liberalization has also not been oriented towards labor productivity^[73]. The role of human capital which addresses the education element has driven labor productivity, in this case wages in Pakistan^[74]. But, poor educational interactions can hinder GDP performance. The more GDP growth slows down, the more it is negatively related to productivity in South Africa^[75]. The expansion of higher education in China is influenced by the broad allocation of education policies. Thus, it plays a key role towards the generation of a productive workforce^[76]. The integration between the supply of education and the workforce relatively expands the development of human resources in Malawi^[77]. Investments in human capital such as education are seen as a way to solve the income problem of working groups. Distortion of educational qualifications has a direct impact on changes in productivity among organizations. Setiadi *et al*^[78] found that there is a mismatch in the quality of work life. Although the level of education and wages are significantly related to labor productivity, it has a negative impact across the age limit of workers in Indonesia.

5. Conclusions

The objectivity of this study aims to analyze the relationship between wage inequality, the average length of schooling, and the dynamics of the economic structure represented by the GRDP of the primary, secondary, and tertiary sectors in Indonesia. During 2016–2023, the more inequality in wages, average years of schooling, and GRDP increased, the

more it stimulated productivity. In the short term, the increase in the five variables actually reduces labor productivity. An increase in wage inequality, average length of schooling, GRDP of primary sector, GRDP of secondary sector, and GRDP of tertiary sector can increase labor productivity in the long term.

The implication indicates that wage inequality among workers, in this case skilled workers who are highly educated and skilled, relatively motivates them to work better. The essential point, increasing the average length of schooling for workers, also increases insight and adaptable skills in technology empowerment. Other results also prove that the increase in economic activity, which is reflected in the economic structure in Indonesia, stimulates producers to increase production capacity, including diversification of products, services and goods.

The recommended technocratic recommendation to decision makers is to take alternative steps. Tightening and monitoring of wage premiums from every business sector that takes into account workers' purchasing power parity, real consumption, inflation, and worker value added, without neglecting personal productivity. With this intervention, there is a protective solution between the employer and the worker. Regulators need to rationalize education that requires a 12-year compulsory education program that consistently adjusts the direction of industrial competence, especially the world of work that prioritizes creativity, innovation, and collaboration. In the midst of economic uncertainty, the government needs to ensure good infrastructure governance, modern technology, and the development of superior local wisdom based on the economic clusters of each province, so on driving positive investment allocations. For regions with small economic growth compared to the domestic economy, it is necessary to support economic structure reforms that focus on the basic sector and are always prioritized, without having to shift to other fields that do not represent the structure of human resources and natural resources.

The agenda for future studies is not limited to labor productivity which is designed to cover wage inequality, but needs to examine the determination of workers' wage security which is oriented towards distributive benefits and compensation. Although the results of education and the rate of economic growth are positive, it is also necessary to highlight these two indicators within the framework of the relevance of the share of knowledge and cases in developing countries.

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