

Determinant Factors Analysis of Labor Productivity in Asean Countries

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Abstract: Labor productivity is an important aspect of economic development. The development paradigm of SDG states that sustainable development, including aspects of humans, is aimed at improving productivity and economic growth. However, the current development of the productivity of ASEAN countries is still diverse which several countries such as Singapore and Brunei Darussalam have a very high productivity, while others are still in the middle and low. This study analyzes the impact of human development, industrialization, foreign investment, and technology on labor productivity. Meanwhile, this study also investigates further the components of HDI (expected years of schooling, mean years of schooling, GNI per capita, and life expectancy) in relation to labor productivity. This study uses data from ASEAN countries from 2010 to 2020 and utilizes panel regression method.

The result shows that HDI, industrial employment, and the index of technological output have a significant influence on labor productivity. On the other hand, FDI and industry sectors have no significant impact on labor productivity. In the second model, this study found that only expected years of schooling and GNI per capita have a positive and significant effect on labor productivity. The results of this study can serve as a basis for consideration in improving labor productivity, particularly by improving human development, industrialization, and technology.

This study recommends policy recommendations to enhance productivity by improving the aspect of technological output and the importance of industrial downstream. It is also urgent to enhance and improve access to education and educational attainment in ASEAN while advancing industrial and technological-based education. The result of the study also implies the importance of support for economic activity and business climate through a stable environment so that can attract and create more jobs. This study also highlights the importance of improvement in labor market data to have good monitoring of labor development.

Keywords: Economy, Productivity, Human Development, Technology

Introduction

In economic development, productivity plays an important role in accelerating development and enhancing competitiveness. In the eighth SDG goal, it is stated that sustainable development, including aspects of human development, is aimed at encouraging productivity and inclusive economic growth. ASEAN countries as part of the global community which aims to increase development in a competitive region certainly need to further increase labor productivity.

This study focuses on ASEAN as one part of the global community. ASEAN is a union of ten countries in Southeast Asia as an organization between countries to cooperate in economic, political, security, military, educational, and socio-cultural matters. ASEAN was founded with the aim of accelerating development in the ASEAN Region. ASEAN consists of Indonesia, Malaysia, the Philippines, Singapore, Thailand, Brunei Darussalam, Vietnam, Laos, Myanmar, and Cambodia. The countries that are members of ASEAN are sovereign countries with their own government systems.

ASEAN has collaborated in various fields to further accelerate development in the region, including in economic terms. ASEAN works together in the corridor of the ASEAN Economic Community (AEC), which is an economic integration in the face of free trade between countries. Apart from that, economic cooperation is also carried out through cooperation through the free trade area, namely the ASEAN Free Trade Area (AFTA) to develop producers

from the production sector at the local level by obtaining special facilities. Meanwhile, industrial cooperation through the ASEAN Industrial Cooperation (AICO) is being implemented to develop a number of industries in several countries.

However, the current development of the productivity of ASEAN countries is still diverse. The International Labour Organization (ILO) calculates productivity from Output per worker (GDP constant 2017), and shows that several countries have very high levels of productivity such as Singapore (153,502) and Brunei Darussalam (134,807). Several other countries are still in the middle category, such as Malaysia (54,046), Thailand (30,285), Indonesia (24,022), and the Philippines (21,090). On the other hand, there are countries that are still below 20,000, such as Vietnam, Laos, Myanmar, and specifically Cambodia which its productivity level is still very low at 8,089. This condition needs more attention, especially for the purpose of advancing development in ASEAN.

In encouraging productivity, various aspects of the approach are needed. Human development is a key aspect of labor productivity. The quality of humans with better education, health, and welfare will lead to more capability and capacity in enhancing and resulting in higher output, and more productivity. Various literature mentions the role of human resource quality on a country's level of productivity. However, most look at the human development aspect of the aggregate index and do not look further into each aspect including education, health, and economy, while others look more from the perspective of human capital.

In development, the role of investment is needed to encourage economic activity. FDI with the flow of capital from other countries will increase the company's capacity to develop business/production. Meanwhile, FDI can lead to an exchange of technology as well as improvement in organizational and management systems which can also increase business efficiency. The influx of FDI will also increase the portion of business capital and create more jobs. Furthermore, economic development and good management will also translate into more productivity.

Industrialization is a state in which a nation is more developed. The country with higher industry will have a higher development. Apart from that, the industrial sector with its business character is processing raw goods to produce higher output. With higher output, economic activities can have more spillover effects and support other sectors in the economy so that they can increase the level of social welfare. In the industrial literature, the important impact of the industrial sector on the country's productivity level is discussed. However, industry sector analysis also needs to be complemented by analysis of employment aspects.

The development of modern technology and production can play a role in boosting productivity. Various literature highlights the role of this technological aspect. However, the literature mostly views technology in terms of ICT and infrastructure. Meanwhile, technological aspects in economic output and modern manufacturing are also important to look at. Technological-based output can contribute more to national development. Technological-based output will require advanced skill and knowledge, and higher quality of human resources. It also leads to more value added to the national economy.

Based on these various conditions, this study analyzes several related determinant factors and examines their impact on labor productivity. The factors analyzed are comprising human development, industrialization, foreign investment, and technology. Meanwhile, this study also investigates further the components of HDI (expected years of schooling, mean years of schooling, GNI per capita, and life expectancy in relation to labor productivity. This study uses data from ASEAN countries from 2010 to 2020 and utilizes panel regression methods.

Theoretical Background

Productivity is a measurement of production efficiency in achieving optimal levels with the support of capital and resources. In economics, production is the activity carried out to produce goods and services, while productivity is the use of resources to produce production including goods and services (Yamit, 2007). From this concept, better quality of human resources will be more efficient in converting resources into goods and services. In this way, an economy will be more productive and result in higher value added. Increasing productivity leads to better levels of efficiency (Heizer & Render, 2016).

Increasing productivity is very necessary in order to achieve optimal output. Manuaba (1992) said that productivity can be enhanced by reducing costs, including the aspect of human resources to execute jobs correctly to obtain the maximum output. Thus, production efficiency supported by optimal work implementation will encourage productivity. Meanwhile, Sinungan (2003) said that productivity is the relationship between physical output, both goods and services and the input used to produce those goods and services. Input used efficiently supported by appropriate and effective human resources will produce optimal output. Apart from that, Ravianto (1989) said that

productivity produces more goods and services for more consumers by using efficient resources, producing output that remains high quality, and using capital skills, management technology, information, energy, and other resources in producing output. Meanwhile, productivity also depends on each country with its own character and goals and is also related to the aim of continuing to strive to improve the quality of life.

Productivity is the link between the output produced and the input used. According to Ervianto (2002), productivity is the ratio of output or production results to input or total resources used. Productivity also includes aspects of the efficient use of human resources or labor used to produce output. The human resource factor is very important in productivity considering that the means of production are basically made by humans (Ravianto, 1986). For this reason, improving human quality is very important. Quality and productive labor are very crucial because other production factors are also influenced by the quality of the labor used (Simanjuntak, 1983). Thus productivity is closely related to labor. Nicholson (2008) said that labor productivity is seen from the ratio of output per number of workers. From these various definitions, productivity is measured using the following equation: $\text{Productivity} = \text{output/labor input}$

This method is also used in measuring productivity by the World Bank. According to the World Bank, productivity is measured by measuring GDP per person employed or labor force. To improve productivity, human development plays a crucial role. The importance of human development in productivity has been a concern in previous research. The level of human development is one of the main factors influencing labor productivity growth (Elmawazini, et al., 2016). Human resources who have a good level of health and education will then be able to make a more optimal contribution to economic activities. As in human development, education and health are the main components. Baharin, et al. (2020) said that education and health have a significant positive effect on labor productivity. In addition, the quality of human resources (a higher level of education and better health status) increases the level of labor productivity, although the impact of health on labor productivity is greater than the educational aspect (Arshad & Malik, 2015).

Other research analyzes the role of humans from the perspective of capital. Atiyatna et al. (2021), suggest that there is a significant connection between independent assessments, human capital, place of work, gender, working hours, and labor productivity. In the study conducted by Mačiulytė-Šniukienė and Matuzevičiūtė (2018), their findings indicate that human capital plays a positively significant role in enhancing the growth of labor productivity. According to Chovancová (2021), the factors of human capital and research and development intensity consistently show a significantly positive impact on the growth of total factor productivity. Meanwhile, humans with higher education will have more impact in enhancing productivity. In the study conducted by Rukumnuaykit & Pholphirul (2015), the research shows that employing individuals with higher education and offering them in-service training results in a statistically significant and positive impact on the increase in labor productivity but hiring workers with higher education appears to yield benefits that are outweighed by the costs incurred through higher average wage expenditures. Previous research focused more on human aspects from the human capital side, however, an approach to the quality of human development is also needed when looking at productivity.

Technological developments provide an overview of the progress of a country. Developed countries generally have good technological development. The technological aspects of a country can be captured from the development of information and communication technology (ICT) in that country and how a country has the ability to produce technological output. Lantip & Rianto (2011) state that information technology is defined as science in the field of computer-based information and its development is very rapid. Countries with good ICT have the means to access knowledge and accelerate production processes. On the other hand, Sukirno (2004), states that there are several factors that motivate all countries in the world to carry out foreign trade, namely obtaining goods that cannot be produced domestically, and obtaining more modern technology from other countries. If a country has good technological output, it will have better competitiveness. Apart from that, Amir (1999) in international trade theory said that countries are gradually trying to develop modern technology to reduce a country's lag behind developed countries. Thus, the technological aspect is very important to provide higher added value in terms of trade balance and comparative advantage.

Previous research has posited that labor productivity (LP) is closely related to knowledge and innovation. Innovation, in particular, has been a crucial element in the contemporary economic growth framework. Solow (1956) observed that external technological innovation plays a pivotal role in enhancing labor productivity, thus contributing to sustained long-term economic growth. The importance of technological aspects is also a focus of discussion in the productivity literature. Abramova & Grishchenko (2020) stated that the relations of ICT, labour productivity, and employment from inter-sectoral perspectives show diverse impacts depending on each sector, and

ICT has a significant influence on LP and employment although occurred gradually. Meanwhile, Mačiulytė-Šniukienė & Gaile-Sarkane (2013), found that for countries with high levels of LP, there was no observed correlation between LP and the use of ICT, as well as ICT readiness. However, for countries with low to medium levels of LP, is primarily influenced by two factors: ICT use and the number of fixed telephone lines along with school enrollment (ICT readiness).

Other literature also found that technology is significant in improving productivity. Arvanitis & Loukis (2009) reported significant positive impacts on labor productivity for various factors, including physical capital, ICT capital, human capital, and organizational practices focused on promoting "employee voice." As per the findings by Relich (2017), the research reveals a positive influence of Information and Communication Technology (ICT) components on LP. Further, Lovrić (2012) found that there is a positive and significant influence of ICT on LP growth in both developed and developing countries. However, the impact in developing countries appears to be contingent on factors like human capital, which encompasses a higher level of education, advanced research qualifications, and development activities. Previous research analyzes the technological aspect more about technological infrastructure and ICT, however, the approach is in terms of production capacity or technological output and its relation to encouraging productivity.

This study also focuses on the aspect of Foreign Direct Investment (FDI). According to Liu et al. (2001), Foreign Direct Investment (FDI) has a positive influence on labor productivity. However, in terms of the relative significance of this impact on labor productivity, the human capital variable was the most critical factor, followed by firm size. Additionally, the presence of foreign entities in the industry is linked with higher labor productivity. Nevertheless, there is a debate around the role of FDI. FDI can have positive effects on productivity, but it's important to note that it can also have negative consequences. According to Aitken & Harrison (1999), when foreign firms producing goods for the local market enter a region, they may attract demand away from local firms. This, in turn, can compel local firms to reduce their production, causing a decrease in their productivity as they are pushed to operate at higher average cost levels. Consequently, the overall net local productivity may decrease as a result of these dynamics.

However, FDI plays a pivotal role in sustaining a nation's economic performance since every country faces constraints in supplying essential business resources. FDI serves as a significant economic catalyst, boosting productivity. This notion is supported by Dollar (1992) and Sachs et al. (1995), as cited in Ali et al. (2019), who assert that nations with substantial foreign investment tend to exhibit robust productivity and experience high levels of economic growth. Further, according to Liu et al. (2001), FDI has a positive influence on LP. However, in terms of the relative significance of this impact on LP, the human capital variable was the most critical factor, followed by firm size. Additionally, the presence of foreign entities in the industry is linked with higher labor productivity. Meanwhile, in the study by Codruta & Denisa (2019), the primary determinants of LP are identified as the economic indicator and the technological indicator. This implies that the increased value gained from exports and the inflow of Foreign Direct Investment (FDI) plays a pivotal role in enhancing LP. The research also indicates that investments in areas such as research and development, the presence of a knowledgeable workforce, education, and patents are direct factors that have a significant influence on the improvement of LP within the European Union.

Industrialization has been a fundamental driver of productivity. Countries that have effectively pursued industrialization tend to have better economic prosperity, even if they later transitioned from traditional manufacturing-based industries to service-oriented economies (as noted by Murphy, et al, 1989). Consequently, industrialization continues to be a primary strategy for economic development in developing nations. For instance, South Korea achieved a threefold increase in economic growth by embarking on an industrialization path accompanied by labor market reforms (as highlighted by Kim & Topel, 1995). Furthermore, LP in the industrial sector often has a more pronounced and positive impact on the overall economy compared to other sectors in many cases.

Industry is an aspect of the economy that is very important for development. Developed countries generally have higher industrial and technological development. In the theory of structural change, developing countries are trying to transform their economic structure from a traditional agriculture economy to a more modern economy, urban approach, industry, and processing and services. The importance of the industrial sector also became the focus of two main views in the theory of structural change. W. Arthur Lewis stated in the theory of structural transformation with a two-sector approach that countries with a low economy consist of two sectors, namely the traditional, agricultural, and rural sectors, where the more developed the country is, the more the economy seen from the workforce will move towards an economy that is more modern, industry-based and has more sustainable development (Todaro & Smith, 2015). Meanwhile, Hollis B. Chenery, in the theory of development patterns, states

that structural changes in a country move from being previously based on traditional agriculture to new industries as an engine of economic growth (Todaro & Smith, 2015). Thus, industry can become the focus of a country's development in order to create faster and more sustainable growth.

Industrialization including an aspect of employment is also a focus of the productivity literature. Erumban (2023) highlights that a persistent emphasis on growth powered by employment has led to a situation where the relationship between LP and output has a weak elasticity, resulting in a trade-off between the growth of employment and LP. This situation has also given rise to a disconnect between LP and per capita GDP growth. Prolonged inefficiency in converting inputs into output, particularly in making productive use of investments, has led to low productivity performance. Meanwhile, in the study by Samargandi (2018), several key findings were identified, the size of employment and compensation exhibited a negative association with LP. In contrast, human capital and capital stock were positively associated with LP. Furthermore, factors such as oil rent, financial development, trade openness, and industrial value addition were found to play significant roles in enhancing LP. Previous literature looked more at the industrial aspect from the sector and output side, but the perspective from the industrial employment aspect is also important.

Research Methodology

This study analyzes several related determinant factors and examines their impact on labor productivity (LP). The factors analyzed are based on the literature review which comprised of human development, industrialization, foreign investment, and technology. Meanwhile, this study also investigates further the components of HDI (expected years of schooling, mean years of schooling, GNI per capita, and life expectancy in relation to LP. This study uses data from ASEAN countries from 2010 to 2020 and utilizes panel regression methods.

This study employs panel regression analysis. The selection of this methodology is predicated on its ability to yield robust estimates, as demonstrated by de la Fuente (2000). Furthermore, the panel regression model leverages a larger sample size, thereby enhancing the strength of estimation results, as highlighted by Hsiao (1995). The panel approach has found widespread application in diverse economic research. According to Gujarati (2003), this method has been referred to by various names in different studies, including pooled data, combination time series and cross-sectional data, micro panel data, longitudinal data, event history analysis, and cohort analysis. Data processing is carried out using the Stata software.

In this research, the first element is to look at the impact of human development, industrialization, foreign investment, and technology on LP. Human Development in this research uses the Human Development Index (HDI), a measure of the main dimensions of human development which consist of a long and healthy life, broad knowledge, and a decent standard of living. HDI data uses data published by UNDP which measures human development by including four indicators, namely Life Expectancy, Expected Years of Schooling, Average Years of Schooling, and per capita expenditure. In terms of industrialization, this study analyzes the industrial sector as well as industrial employment. The industrial sector is the added value (% of GDP) from industry including construction. The World Bank classifies industry as including activities in the mining, manufacturing, construction, electricity, water, and gas industries. Meanwhile, Foreign Investment/FDI is foreign direct investment calculated from net inflows (% of GDP). In terms of technology, this study develops an index of technological output which consists of ICT goods exports (% of total goods exports), Medium and high-tech manufacturing value added (% manufacturing value added), and Medium and high-tech exports (% manufactured exports).

The model used is as follows

$$PDV_{it} = \alpha + \beta_1 HDI_{it} + \beta_2 IDT_{it} + \beta_3 FDI_{it} + \beta_4 TCH_{it} + \mu \quad (1)$$

In addition, this study will look at how HDI (expected years of schooling, mean years of schooling, GNI per capita, and life expectancy in relation to LP. The model used is as follows:

$$PDV_{it} = \alpha + \beta_1 EYS_{it} + \beta_2 MYS_{it} + \beta_3 GNIPC_{it} + \beta_4 LE_{it} + \varphi \quad (2)$$

Where: PDV is productivity, HDI is human development index, IDT is industry, FDI is foreign direct investment, TCH is the technology and μ is error coefficient. In the second formula, PDV is productivity EYS is expected years of schooling, MYS is mean years of schooling, GNIPC is GNI per capita, LE is life expectancy, and φ is the error coefficient.

Results and Discussion

The first regression analysis examines the impact of human development, the industrial sector, industrial employment, foreign investment, and technology on labor productivity (LP). After conducting a series of statistical tests on panel data regression, specifically the Chow Test and Hausman Test, the results indicate that the best model is the Fixed Effect Model.

Table 1. Estimating the Effect of Independent Variables on Labor Productivity

Dependent Variable: Labor Productivity			
Independent Variables	Fixed Effect		
	Coefficient	Robust Std. Error	Prob
Human Development Index	5.3592	0.580762	0.000 ***
Industry Sector	0.0021	0.002456	0.417
Industrial Employment	0.0087	0.003587	0.039 *
Foreign Direct Investment	0.0053	0.003542	0.170
Index of Technological Output	0.0057	0.001608	0.006 **
Constant	5.9094	0.382285	0.000
R-squared	0.8295		
Model Selection Test			
Method	Chi-square	Probability	Conclusion
Chow Test	2815.55	0.0000	Fixed effect
Hausman Test	23.02	0.0000	Fixed effect

Source: Data processed

Key: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

The result of the test reveals that the Human Development Index, Industrial Employment, and the Index of Technological Output positively and significantly influence LP, while the Industry Sector and Foreign Direct Investment do not show statistically significant relationships with LP. The R-Square value recorded at 0.8295 illustrates that the variation of the dependent variable from the regression equation in this model can be explained by the independent variable in the equation of 82.95%.

There is a statistically significant and positive relationship between the Human Development Index and LP. An increase in HDI is associated with a significant increase in LP by 5.3592. There is a statistically significant positive relationship between LP and industrial employment. An increase in industrial employment is associated with an increase in LP by 0.0087. There is a statistically significant positive relationship between LP and technological output. An increase in technological output is associated with an increase in LP by 0.0057.

The second model looks at HDI (expected years of schooling, mean years of schooling, GNI per capita, and life expectancy in relation to LP). Following a sequence of statistical tests in panel data regression, particularly the Chow Test and Hausman Test, the findings suggest that the optimal model is the Fixed Effect Model.

Table 2. Estimating the Effect of HDI Components on Labor Productivity

Dependent Variable: Labor Productivity			
Independent Variables	Fixed Effect		
	Coefficient	Robust Std. Error	Prob
Expected Years of Schooling	0.0163	0.006275	0.029 *
Mean Years of Schooling	-0.0096	0.024295	0.703
GNI Per Capita	0.8896	0.118951	0.000 ***
Life Expectancy	0.0090	0.014459	0.551
Constant	1.0237	0.350371	0.017
R-squared	0.9860		
Model Selection Test			
Method	Chi-square	Probability	Conclusion
Chow Test	541.19	0.0000	Fixed effect
Hausman Test	10.38	0.0345	Fixed effect

Source: Data processed

Key: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

The result of the test reveals that among the components of the Human Development Index, Expected Years of Schooling and GNI Per Capita have statistically significant and positive effects on LP, while Mean Years of Schooling and Life Expectancy do not have a significant influence. The R-Square value recorded at 0.9860 illustrates that the variation of the dependent variable from the regression equation in this model can be explained by the independent variable in the equation of 98.60%.

There is a statistically significant and positive relationship between LP and the expected years of schooling. An increase in expected years of schooling is associated with an increase in LP by 0.0163. GNI per capita has a statistically significant and positive effect on LP. An increase in GNI per capita is associated with an increase in LP by 0.8896.

The findings show that the Human Development Index, Industrial Employment, and the Index of Technological Output positively and significantly influence LP in ASEAN countries. Meanwhile, in the aspect of HDI, the result of the test reveals that among the components of the Human Development Index, Expected Years of Schooling and GNI Per Capita have statistically significant and positive effects on LP. The findings in this study are in line with previous research about human development as one of the main factors influencing LP growth (Elmawazini, et al., 2016), and in line with the research from Baharin, et al. (2020), Arshad & Malik (2015), that human development including education and health have a significant positive effect on LP. Meanwhile, it is also in line with that human quality is important in LP (Atiyatna et al., 2021), and the research from Mačiulytė-Šniukienė and Matuzevičiūtė (2018), Chovancová (2021), and Rukumnuaykit & Pholphirul (2015).

This study also finds that industrialization and technological output have a significant impact on LP. The finding is in line with previous literature that industrialization including the aspect of employment will support productivity (Erumban, 2023). This finding is also in line with the study by Samargandi (2018) in that industrial value addition was found to play a significant role in enhancing LP. Meanwhile, in terms of technological output, is in line with Mačiulytė-Šniukienė & Gaile-Sarkane (2013) who stated that technology partially influenced LP. This is also in line with Arvanitis & Loukis (2009), and Relich (2017) stated a positive influence of Information and Communication Technology (ICT) components on LP. Further, this is also in line with Lovrić (2012) found that there is a positive and significant influence of Information and Communication Technology (ICT) on LP growth in both developed and developing countries.

Conclusion and Suggestion

This study finds that the Human Development Index, Industrial Employment, and the Index of Technological Output positively and significantly influence LP. Meanwhile, in the aspect of HDI, the result of the test reveals that among

the components of the Human Development Index, Expected Years of Schooling and GNI Per Capita have statistically significant and positive effects on LP.

The results of this study provide implications that the human aspect is very important to be the focus of attention in accelerating a country's economic performance and increasing the level of LP. The quality of human development includes the aspects of education, health, and the economy. For this reason, policies related to education and health need to be further strengthened to achieve good realization. Apart from that, the economic aspect, namely people's income, will be driven by economic performance. This research also found that among the HDI aspects, only expected years of schooling and GNI per capita which have a significant positive effect on LP in ASEAN, this is a policy suggestion that access to education needs to be further improved. Apart from that, public policy needs to continue to maintain economic stability and encourage economic activity to continue to move well so that it can be a driving force in increasing productivity.

This research views that ASEAN governments need to strengthen aspects of industrialization to further encourage LP so that they can accelerate economic performance. It is also important for ASEAN to further encourage technological improvements both in terms of facilities and in terms of production output which contributes to the country's economy.

This study recommends policy recommendations to enhance productivity through enhancing technological output and the importance of industrial downstream. It is also urgent to improve access to education and educational attainment in ASEAN while advancing industrial and technological-based education. The result of the study also recommends the importance of support for economic activity and business climate through a stable environment, clear regulations, and public policy support so that can attract and create more jobs specifically in the industrial sector and technological-based output sectors. Cooperation among ASEAN countries is also significant to be strengthened especially in terms of education, knowledge sharing, and vocational development. This study also highlights the importance of improvement in labor market data to have a good monitoring of current labor development.

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