

Do Technological Developments Reduce Unemployment in Indonesia?

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Abstract

Such rapid technological development will affect the absorption of labor in the industry and have an impact on increasing unemployment. Indonesia is among those who have to think the most about the impact of the technological development because in the next 15 years the population could reach 280 million, and could grow again to 300 million. This study is aiming to explore the effect of technological development on unemployment rate in Indonesia. The investments are used as the control variables. Panel Least Square analysis is used to find the effect. According to the analysis, it is found that technological developments positively affect the unemployment in Indonesia. It means that in Indonesia, technological development creates technological unemployment. Generally, the labor force in Indonesia has not yet been ready to face the development. The result also show that only the people in Sumatra, Java, and Bali which the islands where the development of human resources can keep up the technological developments. The result is in line with many people's predictions that technological development can create more unemployment. In order to solve the problem, it is suggested for government to conduct training skill in the application of technology. By conducting new skills training in the application of technology, it is expected that the training is able to withstand the potential of labor forces who cannot be absorbed.

Keywords: *technological development, investment, unemployment*

Introduction

The first industrial revolution was marked by the emergence of steam engine at the beginning of the 19th century. At that time in England many textile industries were made using human labor. When the company switched to using a steam engine for its weaving machines, productivity immediately increased and the price of cloth dropped dramatically. As a result, many textile companies that still use human labor are closed and cannot compete anymore. The unemployment in England increased rapidly at that time. Damage to the textile factories that use machines, because they think textile factories that use steam machines is the cause of the families of workers facing economic problems.

The second industrial revolution also had a similar impact, although in terms of the field it was not as big as the first industrial revolution. The second industrial revolution was marked by the discovery of an electric motor. The Ford car company, which at the time was still led by Henry Ford, had aspirations on how to make his cars sellable to farmers and the people as a whole. Henry Ford also used Taylor's time motion study. Inspired by the study, Ford changed the process of making its car using a conveyor belt. The Ford car issued a Model Y which was heavily affected as "You can by any color but black". At that time the price of the car was around \$ 2,500, but Ford could sell the car for \$ 850. The longer the price of Ford cars went down, so that Ford finally controlled the car market in America at the time.

The third industrial revolution with the entry of computers, and change the industry towards automation. The number of employees in the company is reduced and production costs have dropped dramatically with the presence of microprocessors used in the industry.

Now, we enter the era of the fourth revolution which is often referred to as industry 4.0. This era is marked by industrial processes that use the internet of things (IoT), when sensors are installed in machines, so that machines work independently without human intervention. The process of using IoT will save considerable costs so that production costs will drop dramatically (Li, et al., 2017)

Indonesia is the fifth most populous country in the world. As a developing country, Indonesia is still not free from poverty. In the final report of the Indonesian Central Bureau of Statistics (BPS), the number of Indonesians living below the poverty line as of November 2018 is ± 25.67 million. In addition to the problem of poverty, unemployment is also one of the problems which is still a hot topic to discuss.

One of the causes is that there is still large number of unemployment and the widening income gap (Paramita & Purbadharmaja, 2015; Jonnadi et al, 2012). Theoretically, to break the cycle of poverty is to provide investment or capital with the intention of job creation that will reduce poverty. So it can be seen now that the government's current priority program is to channel large amounts of capital into infrastructure development as an investment.

At present, the Indonesian government is very aggressively channeling capital for infrastructure development, especially in the field of transportation as the main support for the economy and also adding connectivity between regions to encourage inter-regional economies. This infrastructure development is also intended to narrow the gap between regions which specifically will also narrow the gap between individual communities between regions (Delis, et al, 2015). In fact, for the past five years the incessant development of infrastructure has not raised the economy as significantly as indicated by economic growth that is still stagnant at 5 percent per year. The income gap is also still strongly felt in the midst of society.

As a part of the changing world, Indonesia has to follow the changes focusing on the development of technology. Indonesian's government is pushing the digitalization of numerous aspects. Almost all of the public area now has an internet access. Some jobs are now done by machine and technology meaning that there are threats for labor force in Indonesia. The skilled labor force is facing machines and technology. Based on the data of the BPS, Indonesia's Index of Communication and Technology has on the positive track. It can be said that the people of Indonesia now has the better technological literacy. It is shown in table 1 below.

Table 1 Indonesian's ICT Development Index 2015-2017

Sub-index	ICT Dev. Index 2015	ICT Dev. Index 2016	ICT Dev. Index 2017
Access and Infrastructure	4.81	4.88	5.16
Use	2.21	3.19	4.44
Expertise	5.38	5.54	5.75
ICT – Index	3.88	4.34	4.99

Source: Statistics Indonesia

Investment is a key component to break the chain of poverty and unemployment (Kristyanto & Wahyudi, 2017). The intended investment is not only in physical based investments such as infrastructure. But, it is found that government programs to boost infrastructure have not been able to significantly increase economic growth. Investing to the Human capital is also important to do by the government to break the chain of poverty (Wahyuni et al, 2014). Human capital is improved by investing capital in education and training (Syera, 2017). In addition, investment that is no less important is to channel capital for technology development. As we know, the current era, which is known as the industrial era 4.0, requires every country in the world to transform following the development of information technology (Goos, 2018).

At present throughout the world, there is a tendency for an education degree to no longer guarantee someone to get a job. Instead, they have connections and skills in communicating and behaving will actually get a job. A tremendous change in the field of information and communication technology with the

emergence of technological disruption has led to a reduction in the number of job opportunities. This problem is as known as technological unemployment.

Research about how the investments influence the economy of a country has been conducted by many researchers. Song & Van Geenhuizen (2014) examined how the influence of port infrastructure development on economic growth in the provinces and regions that ports have built in China. Ekpung (2014), Kumo (2012) and Pradhan & Bagchi (2013) examine how the influence of transportation infrastructure development on economic growth. In addition, many also examine how the influence of the development of internet technology on the economic performance of a region or country (Manyika & Roxburgh, 2011; Bertschek et al, 2015).

Based on the background described above, we from the research group team of the Department of Economic Development, Universitas Negeri Malang conduct studies and research on the effect of technological development on unemployment. The investments to be analyzed are investments in technology, physical investment in the form of road and building infrastructure, and investment in human capital.

Methods

In this study, I use panel least square (PLS) analysis to know whether the technological developments influence the unemployment in Indonesia. The data used in this study are the Indonesia's unemployment rate of all provinces in Indonesia, Index of Communication and Technology of all provinces in Indonesia, the foreign investment realization of all provinces in Indonesia, and domestic investment realization which are generated from the BPS. All of the data are the data in 2015 – 2017. In order to differ the province located in the big three of Indonesia (Sumatra, Java, and Bali), dummy variable of the location is also used in this study. To know the effect of technological development in the three Islands, we used the interaction variable between the dummy and the ICT.

The model used in this study is:

$$Unemp = \alpha + \beta_1 ICT + \beta_2 \ln_FI + \beta_3 \ln_DI + \delta_1 D_ISL + \delta_2 D_ISL * ICT + \varepsilon$$

Whereby,

Unemp = Unemployment Rate

α = Constant

β, δ = Coefficients

ICT = Index of Communication and Technology

\ln_FI = logaritma napier of Foreign Investment

\ln_DI = logaritma napier of Domestic Investment

D_ISL = Dummy for Location of the Province (whether in Java, Sumatra and Bali Islands = 1 or Otherwise = 0)

$D_ISL * ICT$ = The interaction between Dummy whether the province located in Java, Sumatra, Bali and ICT

The model above is based on the studies and theories that the factors affecting unemployment is investments and also the development of technology. The dummy variable of location is used in the model because in Indonesia, the three islands (Java, Sumatra, and Bali) is the central of Indonesian Economy. The interaction variable between the dummy and the ICT is to know the certain effect of the ICT in the three islands on unemployment. The reason why PLS is used rather than fixed effects is to avoid the collinearity of the dummy variables.

Results and Discussion

According to the 2015 World Summit on Technological Unemployment, the current technological development will create a jobless growth and worldwide unemployment (Peters & Jandric, 2019). The

nowadays' system of production, management, and governance has been taken over by machines and technologies. The automation has happened in almost all aspects of a job. Currently, all countries are competing to develop the use of technology in their daily lives, including Indonesia.

Technological developments in Indonesia can be seen from many startup businesses that were born in Indonesia. Some of them entered the ranks of the unicorns, which are the startups with a valuation of more than one billion US dollars. Many consider that these developments help reduce unemployment. Go-Jek, for example, with millions of partners who have joined, is indeed very helpful in reducing unemployment in Indonesia. Bukalapak, which is an online shop, is very helpful in creating new entrepreneurs selling through the platform.

Let's see if technological development can help reduce unemployment by looking at the following regression results in table 2.

Table 2 Regression Analysis Result

Variable (Dependent Variable is UNEMP)	Coefficient	Std. Error	t	Probability
ICT	1.11568	0.3724987	3.00	0.004*
ln_PMA	0.2533523	0.132634	1.91	0.061**
ln_PMDN	-0.0600669	0.1233215	-0.49	0.628
D_ISL	6.096716	2.15301	2.83	0.006*
D_ISL*ICT	-1.326733	0.4716572	-2.81	0.007*
c	-0.8378681	1.573377	-0.53	0.596
F	3.36			
Prob.	0.0094**			
R-squared	0.2134			
Adj. R-squared	0.1499			

*significant at α 5%, **significant at α 10%

Table 2 shows that the technological development index of Indonesia has a positive and significant impact on unemployment. The effect of dummy variable of Island is positive and significant. The interaction variable of island and technology index negatively and significantly affects unemployment in Indonesia. The F-test result indicates that together, the effect of independent variables on unemployment is significant. The adjusted R-squared result (0.1499) means that the ability of the independent variables to explain dependent variable in the model is only 14.99%, while the rest is explained by other variables outside the model.

Surprisingly, the results of the analysis showed in table 2 indicates that in Indonesia, technological developments had a positive and significant effect on unemployment with a coefficient of 1.11568. It means that technological developments actually increase the number of unemployment in Indonesia. This finding seems to contradict the fact that many people find jobs through technological developments. But, the shift of the economy into a capital-intensive industry (technology and machinery) theoretically will bring up technological unemployment.

Technological advances that are now reaching all levels of society are indeed very helpful in all fields. The number of imported machines used to facilitate human work can produce quality goods that are not inferior to manual manufacturing by humans. The use of machines also makes production more efficient.

But, this not only makes the government and the people relieved, but also raises new problems that have yet to be resolved. The problem is getting more complicated every year, and more and more people are undergoing this profession, namely unemployment. High unemployment has both direct and indirect

impacts on poverty, crime and socio-political problems that are also increasing. With a large enough workforce, the flow of migration that continues to flow, as well as the impact of the prolonged economic crisis to date, making labor problems become very large and complex.

If such a complicated unemployment problem is allowed to drag on, it is very likely to encourage a social crisis. Not only happened to job seekers who are fresh graduated, but also happened to old workers who lost their jobs because their offices and factories were closed. Indicators of social problems can be seen from so many children who began to take to the streets. They become buskers, hawkers and criminals. They are the generation who lost the opportunity to get a good education and coaching.

Another finding is that the dummy of island has a positive coefficient and significantly affects the unemployment, meaning that in the three island (Java, Sumatra, and Bali) the number of the unemployment is higher than other islands. The interaction variable between the dummy and ICT has negative coefficient and also has a significant effect on unemployment which means that the technological developments is only reduce unemployment in the three islands.

The high coefficient of dummy variable illustrates that unemployment in the three islands is quite high. The fact that almost half of Indonesia's population is on the islands of Sumatra, Java and Bali makes the results of the analysis make sense. High population concentration on the three islands makes the number of unemployment is quite high on the three islands.

The analysis also illustrates that technological progress can only reduce unemployment on three islands (Sumatra, Java and Bali). This is due to the fact that the development of Human Resources that is rapidly advancing only occurs on the three islands. The cause is the unequal level of education in Indonesia if we compare the three islands with other islands. It can be said that only human resources in the three islands who are ready to face technological developments.

Conclusions

The problem of unemployment is a problem that has always been a concern of the Indonesian government. Not yet finished how to solve it, Indonesia is again faced with technological developments which, according to some experts, can create a lot of unemployment if the existing resources are not ready to face them. The results of the analysis show that technological developments indeed make the unemployment rate increase (positive and significant effect). On the other hand, technological advances can only reduce unemployment in areas whose resources are ready to face the changes in technology, the islands of Sumatra, Java and Bali. Thus, what must be considered by the government before asking its people to use technology massively is to prepare them to be in charge of new technologies. By synergizing the education sector and the information technology sector, Indonesia's journey in facing the industrial revolution 4.0 can be smoother and easier.

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