# Do Technological Developments Increase Unemployment? Investigation Of Technological Developments, Education, Job Participation, And Unemployment In Thailand

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## Abstract

This study investigates technological developments, work participation, education, and unemployment where each variable is investigated carefully, especially the relationship between variables. In order to investigate the causal link between variables, this study employs a time frame of 21 years, from 2000 to 2020, and uses the autoregressive vector quantitative approach. This study uses secondary data from the world bank with the control variables being internet literacy, Economics participation, education, and unemployment in Thailand. We found that technological developments in Thailand do not threaten to increase unemployment. Where with the development of technology new jobs are created and the role of education in human capital investment becomes important in increasing human ability to master technology and use technology optimally so that technological developments also increase economic participation. Economic participation is an indicator of labor participation and employment.

**Keyword :** Internet Technology Literacy, Unemployment, Education, Economics Participation, Thailand
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## Background

The most important question in economics in the 21st century is how we should prepare for job demands rather than job openings in the labor market. Because in this 21st century, many industries have changed the way things work quite a lot (Rojewski & Hill, 2017). Artificial intelligence (AI) technology that can replace humans in almost everything, or even better in many tasks. These are the same questions that 20th-century people had to answer during the second and third industrial revolutions (Jarrahi, 2018). People in those days were worried that machines and computers would cause massive unemployment. But in the past, what people feared never happened because when old job positions became obsolete. These will be replaced by new jobs because human skills are always doing something better than machines and computers (McClure, 2018).

The reason for the increase in job vacancies is that most companies still want to use a mix of manual work and AI technology, because AI technology has uncompetitive strengths like speed, computational accuracy, etc. While humans themselves have advantages such as empathy , judgments, perceptions, etc., if a company combines the power of artificial intelligence (AI)

technology with humans, uniting the results can definitely lead to better business performance. It has been found that many companies have applied AI technology to their business, resulting in a significant increase in business revenue. This has given companies the confidence and has led to increased demand for hiring employees who are proficient in the creation and upkeep of AI technology. If a company can use AI technology effectively, it will be able to have better performance to the point of causing employment in other positions (Cannata, Breil, Back, Lepri, & O'Hora, 2021).

The number of product sales through e-commerce platforms with large databases is increasing. In this way, companies that come to sell products through e-commerce platforms all have to develop their customer databases that are equally large in size and in various formats. This cannot be done by traditional human data analysis (Zhao, Y., Zhou, Y., & Deng, 2020). Consequently, it is essential to deploy AI technology to aid in the analysis of insights. As a result, these companies need to increase their employees and sales teams who can potentially use AI to increase their sales. Therefore, the adoption of AI technology helps enterprises to grow rapidly as AI improves the ability to study and analyze data from large databases enabling enterprises to make better business decisions (Paschen, Wilson, & Ferreira, 2020). In addition, AI technology also creates opportunities to attract new customers to the company. As the company grows, further, scaling and a rise in employment will increase (Lee, Suh, Roy, & Baucus, 2019).

The use of AI in the industry is expanding, especially in the creation of robots. In the next few years, there will be widespread applications for robots (KILIÇHAN & YILMAZ, 2020). Therefore, there will be a large number of AI-controlled robots entering the market. This has increased the demand for AI-skilled robotics engineers (Su, Togay, & Côté, 2021).

Introduction of AI into healthcare Contributing to a significant increase in employment, this role will play a role in the end-to-end healthcare ecosystem, such as AI-guided food service providers, guided healthcare providers, and healthcare providers the healthcare ecosystem will reduce the need for patients to see doctors and nurses, but increase the number of health care providers at various levels. By analyzing AI-powered data, healthcare providers can tailor healthcare services to better suit and suit their customers' needs (Dolgui & Ivanov, 2022).

The gaming industry has a wide adoption of AI technology, with the role of AI starting from game design and game development processes. Apart from safeguarding games, AI plays an indispensable role for gaming companies. Therefore, game makers have invested in producing games with a lot of capital. There is also a need to hire a large number of AI professionals (van den Broek, Sergeeva, & Huysman, 2021).

AI is increasingly being used in autonomous transportation, and autonomous transportation is increasingly playing a key role in this industry. Self-driving vehicles through AI technology, and automated transportation can be considered a huge source of work for AI engineers and machine learning professionals (Woschank, Rauch, & Zsifkovits, 2020). Financial advisory firms, banks, or investment banking are interested in hiring AI engineers to develop their own systems to identify fraudulent transactions. The financial services industry also wants to use AI to detect credit requests or suspicious transactions by managing security systems in financial markets. The job situation of AI specialists in financial companies is considered a highly developed situation

both during this phase and beyond (Lloyd & Payne, 2019).

Human capital investment is important in this century and education is an important factor in human capital investment (Rusmingsih, Widarni, & Bawono, 2021). The education industry is shifting from traditional offline learning to Online learning. The concept of developing intelligent content suitable for personalized learning. AI technology is needed to assist in the analysis. This has a significant effect on the next learning models. The use of AI technology in education is rapidly expanding, making the education industry very important to hire AI and machine learning experts (Williamson & Eynon, 2020).

AI in the entertainment industry This is an industry where AI technology is widely applied, especially in Video Audio Steaming service companies. Each has applied the potential of AI technology to analyze and entice consumers to buy. The use of AI to determine consumer behavior and consumer media that is suitable for customers is determined through AI algorithms. Therefore, the demand for AI workers in these companies is steadily increasing (Grewal, Hulland, Kopalle, & Karahanna, 2020).

The era of AI technology adoption in business inevitably creeps into the daily life of modern humans. The group of workers who will be directly affected is those who are not aware of and are not adapting to this change. The traditional understanding of non-dynamic work styles and fear of new changes have negatively impacted efforts to train and enhance digital skills to work with AI as it develops (Donepudi, 2020).

Many blame AI for exacerbating unemployment. In fact, AI does not create unemployment, but it is a technology that creates more jobs. Only businesses need to invest and focus on developing AI skills for their workers for their future success. This private workforce must recognize the need to adapt to changes in order to take advantage of new forms of work based on which everyone should always be evolving and learning and should focus on lifelong learning to enable them to find suitable jobs for future work (Rachum-Twaig & Somech, 2022).

Technology has developed rapidly to change the way people live. No one can deny modern technology and no one can resist it. And many more features that meet people's needs in daily life, the novelty will occur in the older generation (Widarni & Bawono, 2022). Although the new generation may not know much of the difference, the old methods and patterns that come from it will gradually disappear. Then modern technology has replaced it, previously we can see from the entry of robots into the industrial sector. and develop into agriculture and more business. Although a person may have raised chickens initially, or that person may have expert knowledge in a particular field, the robots are fed into the program. Everyone must change to keep up with advances in science and technology (Kidd & Murray, 2020).

Internet-era technology and communication development which fulfills human convenience in the daily life of people of all classes is changing the world society. Although the economy or industry will grow and have a modern and fast production system that reduces the complicated processes that use human labor because the technology can act and work for many people more precisely and more efficiently (Ardèvol-Abreu, Delponti, Bonache, & Rodríguez-Wangüemert, 2022).

Currently, all technology, computers, IT, and the Internet can be used, but the problem is that there are pros and cons to the presence of modern technology (Ferri, Grifoni, & Guzzo, 2020). Those who benefit are happy and supportive. However, those who lose their jobs by replacing them with robots or lose their jobs due to technological developments will feel sad. Science, technology, and innovation have unlimited benefits, but they will also be destructively terrible and this will happen very quickly, much faster than we expect. Due to technological advances, It is truly a leap forward, cheaper, more efficient, and has improved performance. Today, computers and science and technology will replace more people (Granulo, Fuchs, & Puntoni, 2019).

The pros and cons of technological developments regarding their impact on increasing unemployment are still being debated. Every change brings "opportunities" that come with the "Pain" of those who cannot adapt, especially the "labor impact" of being replaced by modern machines and advances in science and technology leaping forward for a new generation (Spencer, 2018). Educational institutions must improve the format of teaching methods, the need to accelerate the development of vocational programs which will be the basis for supporting the development of modern technology and must be consistent with the changes that occur must teach children to look ahead. Teach them to think, think well, do good, and how prepare for change (Zhou, Wu, Zhou, & Li, 2020). This study investigates technological developments, work participation, education and unemployment where each variable is investigated carefully, especially the relationship between variables.

## Research Method

In order to investigate the causal link between variables, this study employs a time frame of 21 years, from 2000 to 2020, and uses the autoregressive vector quantitative approach. This study uses secondary data from the world bank with the control variables being internet literacy, Economics participation, education, and unemployment in Thailand. We use the model equation as follows:

$$IL_t = \beta_0 + \beta_1 EP_t + \beta_2 E_t + \beta_3 UE_t + e_t \quad \text{eql 1}$$
$$EP_t = \beta_0 + \beta_1 IL_t + \beta_2 E_t + \beta_3 UE_t + e_t \quad \text{eql 2}$$
$$Ed_t = \beta_0 + \beta_1 IL_t + \beta_2 EP_t + \beta_3 UE_t + e_t \quad \text{eql 3}$$
$$UE_t = \beta_0 + \beta_1 IL_t + \beta_2 EP_t + \beta_3 E_t + e_t \quad \text{eql 4}$$

Where IL is Internet literacy, EP is Economics participation, Ed is education, UE is Unemployment, e is an error term, t is time series, β is the strength of the causal influence, and Eql is an equation.

## Result and Discussion

The autoregressive factor test requires stationary data so it is necessary to do a stationary test. The findings of the ADF test used in this study to examine the data's stationarity are shown in table 1.

Table 1: ADF test results on IL, E, EP, and EU data in Thailand

| Variable | Unit Root | The ADF Test Stat. | 5% Critical Value | Descrip. |
|---|---|---|---|---|
| Internet Literacy (IL) | Level | 5.914241 | 0.0612 | |
| | First Diff | -0.193387 | 0.0943 | |

| | | | | |
|---|---|---|---|---|
| | Second Diff | -6.871231 | 0.0000 | Stationer |
| Education (Ed) | Level | 0.451282 | 0.0732 | |
| | First Diff | -4.028732 | 0.0012 | Stationer |
| Economics participation (EP) | Level | -3.123012 | 0.0792 | |
| | First Diff | -4.452825 | 0.0031 | Stationer |
| Unemployment (UE) | Level | -0.515242 | 0.0921 | |
| | First Diff | -2.115913 | 0.0091 | Stationer |

The IL data are stationary at the second difference, and the E, EP, and UE data are stationary at the first difference level. The optimal lag test was conducted following the stationarity test in order to establish the ideal latency for vector testing. Table 2 displays the outcomes of the best lag test.

Table 2 : Test results at Lag 0 to 3 IL, EP, E, and EU data in Thailand

| Lag | LogL | LR | FPE | AIC | SC | HQ |
|---|---|---|---|---|---|---|
| 0 | -159.5321 | NA | 431.4411 | 16.5311 | 16.7335 | 18.5712 |
| 1 | -91.8269 | 89.4297* | 4.6281* | 11.5776* | 12.5890* | 13.5211* |
| 2 | -86.3180 | 11.1993 | 8.9455 | 13.9727 | 13.8921 | 14.1772 |

According to the test outcomes in Table 2. The lengths of the Lag IL, EP, E, and UE variables are at Lag 1, according to the AIC values at Lag 0 to 2. Lag 1 will be chosen since the outcomes of the five criteria are identical. Then proceed with vector testing. In testing vectors, we chose to use the vector error correction model. The VECM model is a constrained VAR model that takes into account short-term dynamics while limiting variables to long-term linkages (cointegration). Table 3 displays the test results.

Table 3: VECM model analysis

| Cointegrating Eq: | CointEq1 | | | |
|---|---|---|---|---|
| IL(-1) | 0.912311 | | | |
| | | | | |
| EP(-1) | -0.714252 | | | |
| | (0.39142) | | | |
| | [-1.57148] | | | |
| | | | | |
| Ed(-1) | -2.124141 | | | |
| | (0.44159) | | | |
| | [-8.17283] | | | |
| | | | | |
| UE(-1) | -0.351136 | | | |

| | | | | |
|---|---|---|---|---|
| | (0.66317) | | | |
| | [-0.52172] | | | |
| | | | | |
| C | 149.1126 | | | |
| | | | | |
| Error Correction: | D(IL) | D(EP) | D(E) | D(UE) |
| CointEq1 | 0.412426 | -0.053117 | 0.361142 | -0.057842 |
| | (0.24743) | (0.08115) | (0.22141) | (0.03672) |
| | [ 2.43261] | [-0.61272] | [ 3.25123] | [-1.61272] |
| | | | | |
| D(IL(-1)) | 0.087522 | 0.281665 | -0.712161 | 0.134742 |
| | (0.36171) | (0.41237) | (0.29252) | (0.23482) |
| | [ 0.36233] | [ 0.71863] | [-3.24884] | [ 1.26614] |
| | | | | |
| D(EP(-1)) | 0.026291 | -0.282528 | -0.411751 | 0.071751 |
| | (0.59471) | (0.41248) | (0.41557) | (0.27292) |
| | [ 0.03828] | [-0.54613] | [-0.66731] | [ 0.46132] |
| | | | | |
| D(Ed(-1)) | 0.516172 | 0.036527 | 0.411625 | -0.043262 |
| | (0.46269) | (0.32125) | (0.36162) | (0.22441) |
| | [ 1.24611] | [ 0.31214] | [ 1.28542] | [-0.35117] |
| | | | | |
| D(UE(-1)) | 1.232712 | -0.276288 | 0.867671 | -0.352472 |
| | (0.85219) | (0.72126) | (0.86171) | (0.42415) |
| | [ 1.16288] | [-0.38632] | [ 1.41156] | [-0.87852] |
| | | | | |
| C | 3.467115 | -0.843618 | 2.167222 | -0.452873 |
| | (0.82492) | (0.73376) | (0.63471) | (0.41863) |
| | [ 3.41142] | [-1.32324] | [ 2.68282] | [-1.35376] |

The presentation of the VECM model can be seen in Table 4. The results shown in Table 4 can be seen that the table above shows a long-term relationship between four variables, namely internet literacy, economic participation, education, and unemployment. While at the bottom of the table is the interpretation of the short-term relationship between the four variables. In the table above, it can be seen that the variables of work participation, education, and unemployment affect internet literacy.

## Conclusion

Technological developments in Thailand do not threaten to increase unemployment. Where with the development of technology new jobs are created and the role of education in human capital investment becomes important in increasing human ability to master technology and use technology optimally so that technological developments also increase economic participation. Economic participation is an indicator of labor participation and employment.

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