Does Digital Transformation Stimulate the Unemployment Rate in Vietnam?

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Abstract: Digital transformation is a significant driver for better economic growth. However, it might lead to massive changes in the economy's structure. So, the impact of digital transformation on the unemployment rate is an interesting topic, especially in emerging countries. In Vietnam, the relationship between digital transformation and unemployment has not been explored. By adopting the cointegration test, and autoregressive distributed lag approach, our results reveal a negative impact of digital transformation on the unemployment rate in the long term. Besides, the outcome also indicates that inflation negatively influences unemployment both in the short- and long-run. This demonstrates that maintaining a certain inflation rate and boosting investments in digital transformation will be two key elements in keeping unemployment under control in this nation. This discovery contributes to the development of recommendations for lowering Vietnam's unemployment rate.

Keywords: Digital transformation, unemployment, ARDL approach, Vietnam.

1. INTRODUCTION

Digital transformation plays a significant and pivotal role in the fourth industrial revolution. Since the 1990s, extensive scientific research has been conducted on digital transformation in the economic, social, and environmental domains. Digital transformation is a process driven by digital technologies where disruptions occur in organizations, and its impacts are enormous on organizational value creation, strategy, and structural mechanisms (Feroz, Zo, & Chiravuri, 2021). Digital transformation creates opportunities and drives the value and productivity of businesses over the long term, which in turn drives economic growth (Aly, 2020; Finger, 2007; Katz, 2017; Morandini, Thum-Thysen, & Vandeplas, 2020; Park & Choi, 2019). However, it also poses important economic challenges, especially to the labor market (Mabry & Sharplin, 2010; Novakova, 2020). These concerns stem from predictions that technological advancement and digital transformation will displace many productive forces. This leads to unemployment, social unrest, and human suffering (Mabry & Sharplin, 2010). On the contrary, there are still optimistic views about the impact of digital transformation on employment (Mirzaei Abbasabadi & Soleimani, 2021; Žárská, 2020). Accordingly, digital transformation destroy some professions while giving rise to new ones. The key is how nations train their current human resources to adapt to the changes (Žárská, 2020).

In Vietnam, the Government has endorsed the National Digital Transformation Agenda since 2020, with a vision through 2030 to become a digital country. This is expected to contribute to building a digital society, vigorously promoting and restructuring the economy. In addition, digital transformation helps to innovate growth models and improve productivity and competitiveness. Aside from these positive expectations, Vietnamese researchers are concerned about the consequence of digital transformation on unemployment in the short- and long-run. However, the lack of quantitative studies makes research results that are still estimated, conjectural and qualitative. Therefore, to clarify the relationship between these two variables in Vietnam, the autoregressive distributed lag (ARDL) approach was employed to provide evidence of the impact of digital transformation on unemployment in Vietnam from 1990 to 2019. Based on these findings, the authors suggest solutions to capitalize on the benefits of digital transformation.

2. BACKGROUND THEORY AND LITERATURE REVIEW

2.1. Concepts

There are quite a few approaches to digital transformation. According to Südekum and Woessner (2019): "*digital transformation a process that uses digital technologies to create new or modify existing processes, products and services to cater better to business or customer needs. This process generates opportunities and drives long-term value and*

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productivity". Helmy, Abdelaal, and Zaki (2017) argue that digital transformation is a "process through which companies converge multiple new digital technologies, enhanced with ubiquitous connectivity, with the intention of reaching superior performance and sustained competitive advantage, by transforming multiple business dimensions, including the business model, the customer experience (comprising digitally enabled products and services) and operations (comprising processes and decision-making), and simultaneously impacting people (including skills talent and culture) and networks (including the entire value system)".

Unemployment is understood as when people of working age can work, want to work but can not find a job. The unemployment rate is usually determined by the number of unemployed people in the total labor force. Forms of unemployment include: unemployment by age, gender, urban-rural religion, and ethnicity. Nevertheless, if we consider unemployment by cause, it will have the following three types: (*i*) frictional unemployment - this is when workers leave their old jobs to find new ones, or new workers enter or re-entering the workforce need time to find a job. (*ii*) structural unemployment - this type of unemployment occurs when a structural imbalance exists between the supply and demand for labor. The reason may be due to the lack of skills of workers, or the difference in residence. The combination of mechanical unemployment and structural unemployment is called natural unemployment. The natural unemployment rate is the rate of unemployment when the labor market is in equilibrium. (iii) cyclical unemployment - this level of unemployment corresponds to each stage in the economic cycle. According to Keynes's theory, this form of unemployment will disappear in the long run.

2.2. Background Theory

Schumpeter's Theory of Creative Destruction

Schumpeter believes that the change in technological factors will bring changes in the socio-economic. New technology will gradually replace old technology, from which new industries, new economic structures, and new job opportunities will appear. He also believes that unemployment caused by scientific and technological innovation is inevitable and an inherent disadvantage for society.

Ricardo's Classical Economic Theory

Ricardo points out that technological progress will create new jobs and promote employment. However, the widespread use of large machines leads to the contradiction that machines replace labor. Based on that, Ricardo realizes that scientific and technological innovation gave birth to many new machines, but these machines replace the workforce. This creates a lower demand for labor, thus causing more and more unemployment (Ricardo, 2015).

Marxist Theory

Marx's theory holds that the growth rate of labor replacement due to science and technology is greater than the growth rate of labor demand due to capital accumulation in the short run. It means that scientific and technological innovation will lead to unemployment. However, according to Marx, technological innovation contributes to expanding the economic and social scale, improving labor productivity in the long run. The improvement of labor productivity will bring more capital accumulation to encourage enterprises to increase investment and expand production scale. In the long term, production and non-manufacturing sectors are born, creating new job opportunities for workers.

Romer's Endogenous Economic Growth Model

Scientific and technological innovation leads to growth, thus creating more jobs. In addition, science and technology innovation will increase knowledge and improve workers' skills, thereby increasing their job opportunities.

2.3. Literature

Most studies on the relationship between technological progress and digital transformation to unemployment are qualitative studies. Research results show that there are many different opinions about the relationship between them, both positive and negative. Tyutyunnikova Svetlana V. (2019) believes that digitizing the economy will negatively affect employment, increasing the unemployment rate among young workers. Frey and Osborne (2017) argue that about 47% of all employment in the United States will be under the threat of replacement by machines, robots, or computer programs, at least in the medium term (i.e., in the next 10 to 20 years). However, there are also positive views that technology and digital transformation make obsolete forms of employment that are no longer useful and will be replaced by more suitable ones. Žárská (2020) believes that digital transformation brings opportunities and threats to the labor market. It may contribute to job creation, but

some occupations are lost. The author also shows that digital transformation negatively impacts developing countries more than developed countries. From that, the author also affirms the role of training activities in improving the skills of employees.

Quantitative research articles also have differences in research results on the impact of technology and digital transformation on the unemployment rate. Pini (1995) studied 6 OECD countries between 1960 and 1990 to clarify the impact of technological change on employment. The results showed no evidence to support the job creation effect of technological innovations. Instead, he observes a negative effect on employment and some equally significant compensation effects, such as export dynamics and the production of new physical capital, both of which are linked to the innovation process. The study of Mirzaei Abbasabadi and Soleimani (2021) conducted research for 163 countries in 2016 to determine the relationship between digital technology expansion and ICT developments on one major economic issue: unemployment. In this way, three indexes of technology (ICT Development Index, The Digital Index, and Technological Readiness) were chosen according to their focus on digital and ICT indicators. By using OLS and GLS estimation methods, along with stability tests. The results show a significant polynomial degree relationship between unemployment and digital technology indexes. The empirical methodology indicates that the relationship is positive in degree 1 and negative in degree 2 coefficients, so it can be concluded that: as digital technologies are expanding, the unemployment rate grows to a maximum point and then begins to decline as technology expands and exceeds a specific value. Jacob Mincer (2000) shows that technology has a positive effect on reducing unemployment in the long run.

Additionally, Additionally, there is evidence of a connection between inflation and unemployment in the study by Omran and Bilan (2021). In this study, the author used the VAR method to analyze data from 1980 to 2019 in Egypt. According to the findings, there is a negative relationship between inflation and unemployment.

3. RESEARCH MODEL, DATA SOURCES, METHOD

The study aims to analyze the association between digital transformation and unemployment in Vietnam from 1990 to 2019. Based on the theoretical background and previous empirical studies, we propose a model as follows:

$$UE_t = \beta_0 + \beta_1.Grow_t + \beta_2.Inf_t + \beta_3.\ln EDT_t + u_t \quad \text{(Equation 1)}$$

where: *u* is the error terms, *t* is the years (from 1990 to 2019);

The *UE* variable is the unemployment rate (unit: percent); the *Grow* variable is the growth of GDP per capita (unit: percent); and the *Inf* variable is the inflation rate (unit: percent). The data of three variables were collected from the World Bank. The *EDT* represents the value added by digital transformation (unit, millions U.S dollars), and it was taken from the https://www.wider.unu.edu/. The *EDT* variable is transferred under logarithmic to smooth the data.

The autoregressive distributed lag (ARDL) approach is employed to clarify the impact of digital transformation on the unemployment rate. This method was proposed by Pesaran, Shin, and Smith (2001) and is considered to be the most successful, flexible, and easy-to-use estimation technique for multivariate time series analysis. The ARDL estimation method is based on the Error Correction model - ECM. The representation of equation 1 as an ECM model is as follows:

$$UE_t = \alpha_0 + \beta_1.UE_{t-1} + \beta_2.Grow_{t-1} + \beta_3.Inf_{t-1} + \beta_4.LnEDT_{t-1} + \sum_{k=1}^{p-1}\alpha_{1k}.\Delta UE_{t-k} + \sum_{k=0}^{q-1}\alpha_{2k}.\Delta Grow_{t-k} + \sum_{k=0}^{q-1}\alpha_{3k}.\Delta Inf_{t-k} + \sum_{k=0}^{q-1}\alpha_{4k}.\Delta \ln EDT_{t-1} + \omega_t$$

(Equation 2)

Where: Δ is the difference; β_1, β_2, β_3, β_4 are the long-term effects; α_1, α_2, α_3, α_4 are short-term effects; ωt is the error of the estimate.

4. EMPIRICAL RESULTS

4.1. Descriptive Statistics

Table **1** shows that Vietnam's unemployment rate is relatively low and stable. This explains why Vietnam's unemployment rate is listed in the ten lowest globally (according to the Ministry of Labour, Invalids and Social Affairs). Meanwhile, Vietnam's economic growth rate in this period had strong fluctuations in a positive direction. Vietnam's highest economic growth rate in this period reached nearly 7.7%. Regarding inflation, the period 1990-2020 also witnessed strong fluctuations. The highest inflation rate reached approximately 73%. However, at some point, the inflation rate was controlled to a minimum, reaching -0.19%. Digital transformation activities seem to have only brought significant effects since the 2010s, and increased sharply from that time onward. The statistical

results describing the variables in the model are illustrated more clearly in Table **1**.

Table 1: Descriptive Statistics Table

Variables	Mean	Std. Dev.	Min	Max
UE	1.903	0.454	1.000	2.870
Grow	5.365	1.293	1.979	7.699
Inf	12.416	14.668	-0.190	72.546
lnEDT	6.793	1.346	3.823	8.719

Source: According to the author's calculation.

4.2. Empirical Results

Unit Root Test

The authors perform a stationarity test to avoid spurious regression results. To accomplish this, the augmented Dickey-Fuller test is used. The test results in Table **2** show that three variables (*Grow*, *Inf*, and *lnEDT*) are stationary at the level, while the *UE* variable is stationary at the first difference. Hence, no variables are stationary at the second difference, and the condition to apply the ARDL approach is satisfied.

Table 2: Stationary Test Results

Variable	Level	First difference
	ADF	ADF
UE	-2.3152	-7.7322***
Grow	-2.8170*	-3.6906***
Inf	-2.7322*	-6.1227***
lnEDT	-4.8378***	-5.6889***

*p<0.1, **p<0.05, ***p<0.01.
Source: According to the author's calculation.

Bounds Test

Next step, the bound cointegration test is applied. Table **3** indicates that the t-statistic (= -3.76) value is smaller than the upper bound value at the 10% significant (= - 3.46). It implies that there is cointegration among selected variables, and applying the ARDL approach is a fit.

Short-Run Impact Analysis

The study employed the ARDL approach to explore the impact of digital transformation, and inflation on the unemployment rate in Vietnam. Table **4** shows that only the inflation rate affects the unemployment rate in the short run. More detailed, the outcome reveals that increasing inflation leads to a decrease in the unemployment rate. Besides, the coefficient of *CointEq(-1)* variable is -0.83 and significant at the 1% level, implying that unemployment is likely to self-adjust to the equilibrium point in less than two years, and our proposed model is a fit.

Table 3: Bounds Test Result

t-Bounds test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
t-statistic	-3.7633	10%	-2.57	-3.46
		5%	-2.86	-3.78
		2.5%	-3.13	-4.05
		1%	-3.43	-4.37

Source: According to the author's calculation.

Table 4: The Short-Run Estimated Impact Results

Variable	Coefficient	Std. Error	t-statistic
Intercept	3.1677***	0.8409	3.7667
Δ.*Grow*	-0.0048	0.0528	-0.0925
Δ.*Inf*	-0.0287***	0.0100	-2.8499
Δ.*EDT*	0.0085	0.0061	1.3951
CointEq(-1)	-0.8312***	0.2208	-3.7633

*p<0.1, **p<0.05, ***p<0.01.
Source: According to the author's calculation.

Long-Run Impact Analysis

In the long term, the results in Table **5** show the impact of inflation and digital transformation on the unemployment rate in Vietnam. Like in the short run, inflation negatively contributes to unemployment in the long run. For a 1% increase in the inflation rate, the unemployment rate decreases by approximately 0.04%. Similarly, digital transformation has a positive effect on reducing unemployment in Vietnam. The findings show that a 1% increase in digital transformation leads to a 0.31% decrease in the unemployment rate. In addition, the study found no statistical evidence for the impact of economic growth on the unemployment rate.

Table 5: The Long-Run Estimated Impact Results

Variable	Coefficient	Std. Error	t-statistic
Grow	0.1160	0.0998	1.1625
Inf	-0.0387***	0.0125	-3.0816
lnEDT	-0.3097***	0.0978	-3.1645

CointEq(-1) = UE - (0.1161*Grow - 0.0387*Inf - 0.3097*lnEDT).
* p<0.1, ** p<0.05, *** p<0.01.
Source: According to the author's calculation.

Diagnostic Tests

The diagnostic tests in Table **6** show that the model does not suffer errors such as serial correlation and heteroskedasticity. The CUSUM and CUSUMSQ tests indicate that our proposed model is stable. These findings allow us to conclude that the estimated results from the ARDL approach in Tables **4** and **5** are reliable.

Table 6: Additional Tests

Type of tests	p-value
Breusch-Godfrey test	0.7758
White test	0.8859
Ramsey Reset Test	0.2301
Normality test	0.9374
CUSUM test	stable
CUSUM of Squares test	stable

Source: According to the author's calculation.

5. DISCUSSION

The study found that digital transformation has a negative effect on the unemployment rate. This conclusion is in line with Jacob Mincer (2000); Mirzaei Abbasabadi and Soleimani (2021). It implies that increasing investment in digital transformation activities will reduce the unemployment rate in Vietnam. In addition, this impact is only observed in the long term. Explaining this result, the authors believe that it comes from the following reasons:

First, digital transformation creates new job opportunities to replace obsolete jobs in the long term. Many researchers have confirmed this conclusion (Helmrich, Weber, Wolter, & Zika, 2019; Nasati, 2020). This creates opportunities for workers who have the ability to change occupations to find new jobs.

Second, it is not without concern that digital transformation creates many fluctuations in the labor market, especially in countries with low labor productivity mainly based on outsourcing and assembly. However, we still fully believe in the ability of Vietnamese workers to adapt and learn quickly. This will greatly determine the ability to overcome limitations and take advantage of opportunities in the digital period.

Vietnam maintains a moderate inflation rate, which will boost household consumption. This is an opportunity for businesses to grow and develop. Thereby, job opportunities will also increase along with the expansion in the size of the business.

6. CONCLUSION AND POLICY IMPLICATIONS

This study aims to explore the impact of digital transformation, and inflation on the unemployment rate in Vietnam from 1990 to 2019, with the desire to test whether promoting digital transformation activities will increase the unemployment rate in Vietnam or not? By applying the ARDL approach, some conclusions are summarized as:

1. In the short term, digital transformation has no impact on the unemployment rate. But in the long term, digital transformation reduces unemployment. This shows that the more investment in digital transformation activities, the lower the unemployment rate is.

2. Inflation has a negative impact on unemployment in Vietnam both in the short and long term. This shows that maintaining an appropriate inflation rate also helps Vietnam solve problems related to employment.

Policy Implications

According to statistical data, Vietnam is one of the 10 countries with the lowest unemployment rate in the world. In 2021, a sudden increase in unemployment was recorded due to the Covid-19 pandemic. On the individual side, unemployment causes significant impacts on the material and spiritual life of workers and their families. On the other hand, unemployment is a waste of human resources, does not promote economic development, and easily leads to social disturbances and political upheavals. Therefore, solving unemployment and reducing this rate is always a concern for policy-makers. Based on the empirical results, some recommendations are suggested, as follows:

1. Increase investment in digital transformation activities. Digital transformation is a long process and a trend. This is an activity that is expected to play an important role in sustainable development issues, improve labor productivity, as well as enhance connectivity. In addition, according to the research results, digital transformation also helps to reduce the unemployment rate. To successfully carry out this activity, it is necessary to build and perfect the digital infrastructure. Items such as IoT, telecommunications, internet, safety, and network security need to be upgraded and improved.

2. Government and enterprises should be focused on training and improving the skills of workers. This helps workers increase their chances of being competitive in the job search process and helps them keep up with the demands of digital transformation.

REFERENCE

Aly, H. (2020). Digital transformation, development and productivity in developing countries: is artificial intelligence a curse or a blessing? *Review of Economics and Political Science, ahead-of-print*(ahead-of-print). https://doi.org/10.1108/REPS-11-2019-0145

Feroz, A. K., Zo, H., & Chiravuri, A. (2021). Digital Transformation and Environmental Sustainability: A Review and Research Agenda. *Sustainability, 13*(3), 1530. https://doi.org/10.3390/su13031530

Finger, G. (2007). Digital convergence and its economic implications.

Frey, C. B., & Osborne, M. A. (2017). The future of employment: How susceptible are jobs to computerisation? *Technological Forecasting and Social Change, 114*, 254-280. https://doi.org/10.1016/j.techfore.2016.08.019

Helmrich, R., Weber, E., Wolter, M., & Zika, G. (2019). The Consequences of Industry 4.0 for the Labour Market and Education: Scenario Calculations in Line with the BIBB-IAB Qualifications and Occupational Field Projections. In (pp. 37-56). https://doi.org/10.1007/978-3-030-26068-2_4

Helmy, M., Abdelaal, I. M., & Zaki, M. (2017). *Digital Business Transformation and Strategy: What do we know so far?*

Jacob Mincer, S. D. (2000). Technology, Unemployment, and Inflation. *NBER Working Paper No. w7817*. https://doi.org/10.3386/w7817

Katz, R. (2017). Social and Economic Impact of Digital Transformation on the Economy. *International Telecommunication Union (ITU)*.

Mabry, R. H., & Sharplin, A. D. (2010). *Cato Institute Policy Analysis No . 68 : Does More Technology Create Unemployment ?*

Mirzaei Abbasabadi, H., & Soleimani, M. (2021). Examining the effects of digital technology expansion on Unemployment: A cross-sectional investigation. *Technology in Society, 64*, 101495. https://doi.org/10.1016/j.techsoc.2020.101495

Morandini, M. C., Thum-Thysen, A., & Vandeplas, A. (2020). *Facing the Digital Transformation: are Digital Skills Enough? European Economy Economic Brief 54*.

Nasati. (2020). Việc làm tương lai và định hình chiến lược con người trong cuộc Cách mạng công nghiệp lần thứ Tư.

Novakova, L. (2020). The impact of technology development on the future of the labour market in the Slovak Republic. *Technology in Society, 62*. https://doi.org/10.1016/j.techsoc.2020.101256

Omran, E., & Bilan, Y. (2021). The impact of inflation on the unemployment rate in Egypt: a VAR approach. *SHS Web of Conferences, 107*, 06009. https://doi.org/10.1051/shsconf/202110706009

Park, H., & Choi, S. (2019). Digital Innovation Adoption and Its Economic Impact Focused on Path Analysis at National Level. *Journal of Open Innovation: Technology, Market, and Complexity, 5*, 56. https://doi.org/10.3390/joitmc5030056

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics, 16*(3), 289-326. https://doi.org/10.1002/jae.616

Pini, P. (1995). Economic growth, technological change and employment: empirical evidence for a cumulative growth model with external causation for nine OECD countries: 1960–1990. *Structural Change and Economic Dynamics, 6*(2), 185-213. https://doi.org/10.1016/0954-349X(94)00008-W

Ricardo, D. (2015). *On the Principles of Political Economy, and Taxation*: Cambridge University Press. https://doi.org/10.1017/CBO9781107589421

Südekum, J., & Woessner, N. (2019). *Robots & the rise of European superstar firms: Fellowship Initiative "The Productivity Challenge: Jobs & Incomes in the Dawning Era of Intelligence Robots"*: Luxembourg : Publications Office of the European Union.

Tyutyunnikova Svetlana V., R. T. K. (2019). Youth Employment and Unemployment in the Digital Economy Epoch. *9th International conference on management, economics and humanities*. https://doi.org/10.33422/9th.icmeh.2019.09.993

Žárská, V. (2020). the importance of education and the threat of unemployment in the conditions of the digital economy *sociálno-ekonomická revue.*

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https://doi.org/10.6000/1929-7092.2022.11.01