The Impact of Digital Economy and Net Export of Goods and Services Towards Employment in the Selected Southeast Asia Countries

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Abstract: The digital economy is rapidly growing and transforming the way people work and do business globally. This growth has a significant impact on employment in the Association of Southeast Asian Nations (ASEAN) countries. This study aimed to examine the impact of the digital economy and net export on employment in selected ASEAN members, Malaysia, Indonesia, Singapore, and Thailand. Sample years were extracted from 1991 to 2021 and the panel data regression method was applied in this study. The result of this study showed that the digital economy; fixed broadband subscription (LBROAD), internet users (LUSER), and net export (LEXP01) had a significant influence on employment (LTEMP).

Keywords: *Digital economy, ASEAN, export, employment*

1. Introduction and Background

The digital economy has significantly impacted employment in ASEAN countries, particularly in Indonesia, Malaysia, Singapore, and Thailand. It has created new job opportunities in areas like e-commerce, digital marketing, data analysis, and software development, such as delivery drivers, customer service representatives, and data analysts (Xia & Pei, 2021). However, it has also led to job displacement and wage stagnation for low-skilled workers in industries disrupted by automation and digital technologies (Comin et al., 2008). The gig economy, where workers work as independent contractors, may lead to increased precarity and reduced social protections for workers (Muhyi et al., 2023). The rapid expansion of the Internet has led to job losses and increased unemployment rates. The digital economy requires workers with the necessary skills, particularly in IT, which can lead to a wage-price rise due to a gap between supply and demand (European Commission, 2010). In addition, the digital economy has become an important element in the rapid development of the global economy and the promotion of export trade. Hence digital transformation and export products in an enterprise are interrelated (Qian, 2023). This is further argued by Zhang et al. (2022) and Wang et al. (2023), who verified that the digital economy could promote export trade, and they found the relationship between e-commerce, technological progress and urban export trade.

ASEAN countries need to adopt proactive policies and invest in up-skilling and reskilling programs to help workers transition to new job opportunities (Kwan, 1994). This may include initiatives to promote digital literacy, encourage entrepreneurship, and support workers in acquiring new skills and finding new job opportunities in growing industries. Governments must address the challenges posed by the gig economy and ensure workers are adequately protected by labor laws and social protections (Yusof et al., 2022). In conclusion, the digital economy has enabled employment and the global network of commercial, economic, and professional exchanges.

The digital economy, a fourth revolution, significantly impacts job availability in the market due to the expansion of ICT and new digital technologies, such as data analytics, artificial intelligence, 3D printing, cloud computing, IoT, and robots. This can either change or eliminate existing jobs, creating new activities, businesses, and job scopes, especially for youngsters who can adapt easily to technology (Strange et al., 2022). Economic advances, globalization, and shifting consumer preferences also affect the supply and demand of the labor force. E-Bay, a globally famous marketplace, is an example of how the digital economy can reduce unemployment rates (Bello & Perez, 2019). However, the digital economy also automates tasks, such as translation, handwriting recognition, and automotive navigation, putting jobs in logistics, transportation, and office and administrative support at risk (Frey & Osborne, 2013). Some cognitively erratic processes can be

automated, such as the diagnosis of chronic diseases and the treatment of cancer in hospitals (Cohn, 2013). Although, tasks that are difficult to automate, such as creativity, social skills, and talents, are still crucial in various activities, such as administration, business, arts, media, education, and healthcare.

The Association of Southeast Asian Nations (ASEAN) is a region with ten member states that has experienced significant trade growth, with both goods and services playing pivotal roles. The services sector, which contributes between 38% and 69% of each member state's GDP, is the primary recipient of Foreign Direct Investments (FDI) into the region (Gavurova et al., 2020). Travel services lead ASEAN's service exports, while financial services play a crucial role in its export portfolio. Transport services dominate ASEAN's service imports, and intellectual property charges contribute significantly to ASEAN's import of services (ASEAN, 2020).

To facilitate trade in goods, ASEAN is virtually tariff-free, with tariffs eliminated on 98.6% of products under the ASEAN Trade in Goods Agreement (ATIGA) (ASEAN, 2020). This reflects the region's growing interconnectedness, with approximately 25% of ASEAN's goods exports going to other member states (Handoyo et al., 2021). However, there are challenges, such as addressing non-tariff barriers, enhancing trade facilitation, and leveraging ASEAN's digital transformation (Sandkamp et al., 2019). Strengthening regional supply chains and collaborating in manufacturing and logistics can enhance competitiveness among Southeast Asia countries (Nguyen, 2023). By leveraging its strengths, addressing challenges, and embracing opportunities, ASEAN can continue its trajectory toward a competitive, integrated, and prosperous economic community.

This study is conducted to examine how the digital economy and net exports play an essential role employment in in Southeast Asia Countries. As the digital economy and exports are the keys to a successful world economy, employers are now dealing with the most recent pressures from the digital economy in increasing their productivity.

2. Literature Review

Keynesian Theory on Employment
The Keynesian theory, developed by British economist John Maynard Keynes during the Great Depression, explains the relationship between employment and economic activity. It suggests that employment is not determined by market forces but by aggregate demand, which includes goods and services demanded by consumers, businesses, and the government (Pettinger, 2018). Keynes argued that changes in aggregate demand can significantly impact employment, and government intervention may be necessary to stimulate demand and maintain full employment (Heise, 2009).

The digital economy affects employment in various ways, such as increased demand for skilled workers in software development, data analysis, and digital marketing (Heise, 2009). However, digital technologies can also automate certain tasks, potentially displacing jobs and increasing unemployment rates. The gig economy, where individuals work on short-term contracts or freelance, has also been facilitated by digital platforms (Li, 2023).

Keynes proposed that total employment equals total output, which is equal to total income. He also emphasized the multiplier effect, which states that changes in spending have a magnified impact on economic activity. When aggregate demand is insufficient to maintain full employment, the government can stimulate demand through policies, such as increasing government spending, reducing taxes, and lowering interest rates (Pettinger, 2018).

Policymakers should consider the impact of digitalization on employment when designing economic policies, and investing in digital infrastructure, education, and skills development (Li, 2023). Balancing technological progress with social welfare remains a challenge, and Keynesian principles can guide policy decisions.

Export Based Theory
The export base theory, also known as economic base theory, is a framework for analyzing local economies and understanding how changes in economic activity affect employment and development within a region. It posits

that trades act as an engine of growth, providing externalities and productivity benefits to regional economies (Conway, 2022). The Heckscher-Ohlin model suggests that export growth is driven by regional labor and capital supplies, with regions specializing in producing goods that align with their abundant factors of production (Thomas, 1964).

This model can lead to direct employment, indirect employment, and multiplier effects, with increased income from exports creating a positive feedback loop (Conway, 2022). The theory emphasizes the pivotal role of exports in regional development, enabling policymakers and businesses to make informed decisions to foster resilient and thriving economies. In summary, the export base theory is not just about trade but also about shaping employment, prosperity, and the future of the region, particularly in Southeast Asia (Thomas, 1964).

Employment

An empirical review of employment can examine the distribution of employment across countries and regions, macroeconomic factors like recessions and monetary policy, labor market policies like minimum wage laws and unemployment benefits, and demographic factors like population growth and aging (Wu & Yang, 2022). The current decade has seen higher levels of unemployment, temporary jobs, and job insecurity due to global economic crises, wars, immigration, and pandemics (Nourafkan & Tanova, 2023).

Multispectral dynamic models have been used to examine how technological advancements affect the compensating framework, showing that compensation mechanisms might more than makeup for early job losses caused by innovation (Filippi et al., 2023). The nature of employment will change, and millions of people will need new skills due to the applications of twelve technologies.

The impact of technological change and automation on employment will be considered, including job displacement and the creation of new types of jobs (Wu & Yang, 2022; Berman et al., 1998). The role of various stakeholders, such as employers, workers, and governments, in shaping the employment landscape will be evaluated (Bertani et al., 2020).

Broadband Subscription and Employment

Broadband subscription is a crucial aspect of the digital economy, with its relationship with employment being a subject of much research and debate (Zuo, 2021). Some argue that increased broadband adoption leads to increased employment, as it provides job opportunities and business tools that promote productivity (Kolko, 2012). However, others argue that the relationship between broadband subscription and employment is more complex and may be influenced by factors, such as education, income, technological change, competition, innovation, and availability of infrastructure and services supporting economic growth (Koutroumpis, 2019).

The impact of broadband on employment is significant, particularly in developing countries where access to the internet and digital tools may be limited. A study by Kolko (2012) examined the causal relationship between broadband subscription and employment and identified industries likely to be impacted by faster networks. The empirical review could also examine the relationship between broadband access and social and economic outcomes, such as economic growth, innovation, and employment, and consider the impact of broadband on various segments of the population, including rural communities, low-income households, and elderly individuals (Geraci et al., 2022).

Digital economics can help evaluate the effects of broadband adoption, considering factors, such as infrastructure, technology use, and organizational operations (Röller & Waverman, 2001). Broadband can also affect the way an organization runs, as better penetration of the internet can have a greater effect on production (Koutroumpis, 2019). The effectiveness of different broadband technologies, such as fiber, cable, and wireless, in meeting the needs of different users and communities should be evaluated.

Internet User and Employment

An empirical review should examine internet adoption across different countries and regions, considering factors like education, income, and age (Wahab et al., 2020) Government policies, such as investment in infrastructure and digital literacy, can promote internet adoption and usage. Cultural and social factors, such as gender and language, also impact internet usage (Edrak et al., 2022). The relationship between internet users

and employment is crucial, with the number of people with access to and using the internet correlated with employment levels (Wahab et al., 2020; Hsieh & Goel, 2019).

The review should also examine the relationship between internet usage and other economic and social variables, such as economic growth, employment, and political engagement (Wahab et al., 2020). The rise in computer adaptation has been influenced by government encouragement and affordable access (Sharon, 2020). The use of computers includes browsing the internet, locating documents, performing chores, discovering resources, and using them for leisure activities (Coovert & Thompson, 2014). In addition, psychological communication theories emphasize internet usage, with internet users seeking to fulfill their needs and desires (Nagam, 2023).

Net Export and Employment
The impact of net exports on employment is a contentious issue amongst economists. Some argue that net exports can create jobs in the exporting country, while others argue that they can lead to job losses in the importing country (Tejvan, 2017). One study by Mohler et al. (2018) has shown that rising imports do not necessarily increase unemployment rates. High-quality development of foreign trade in China's border regions has a positive impact on residents' employment (Liu et al., 2022). However, the International Labour Organisation (ILO) (2015) found that while exports can create jobs in certain sectors, they can also lead to job losses in other sectors. For example, an increase in exports of manufactured goods can create jobs in the manufacturing sector, but it can also lead to job losses in other sectors like agriculture.

The impact of net export on employment is complex and depends on factors, such as the type of goods being exported, domestic market competition, and investment in the exporting country (Sasahara, 2019). The quality of employment created by exports can also vary depending on the type of industry and the level of education of workers (OECD,2017). In conclusion, the relationship between net exports and employment is complex and can vary depending on various factors.

3. Research Methodology

This section focuses on the regression model, specifically the influence of the digital economy and net export factors on the total employment amongst selected ASEAN countries. The relationship between the independent variables which are broadband subscription, internet users and net export of goods and services with the dependent variable which is employment is examined by using a static panel data analysis.

Sample of Study
The initial sample data collected are related to all ASEAN countries with a time frame of 30 years. Due to the limited of complete and accessible data for the study period and certain countries, the research study has been using selected ASEAN countries, such as Indonesia, Malaysia, Singapore and Thailand. The variables used in this study were fixed broadband subscription (LBROAD), internet user (LUSER), net export of goods and services (LEXP01) and the dependent variable the total employment (LTEMP) were all collected from the World Bank Database with a period from 1991 to 2021.

Theoretical Model
The static panel data regression is used to investigate the effect of digitalization, as well as macroeconomic factors, such as broadband subscription, internet users and total export of goods and services towards the total employment in these four ASEAN countries.

$$L\ TEMP_{it} = \beta_0 - \beta_1\ LBROAD_{it} + \beta_2\ LUSER_{it} + \beta_3\ LEXP01_{it} + \varepsilon$$

Where, $TEMP_{it}$, is the Total of Employment for the ASEAN countries I in year t. $LBROAD_{it}$ is a Fixed Broadband Subscription which will measured by broadband subscription per 100 people and $LUSER_{it}$ is internet users which will measured by individuals using the internet (% of the total population). $LEXP01_{it}$ is the net export of goods and services which is measured by trade % GDP.

This study attempted to seek the relationship between the digital economy and the net export of goods and

services towards the total employment of four ASEAN countries and examine whether this study aligned with the Endogenous Growth theory and findings from other past researchers.

4. Results & Discussion

Data Analysis
A static panel data analysis was used in this study to investigate and measure the effect of digital economy development towards employment amongst four ASEAN countries which is a cross-sectional unit, N=4 and for the period, T=31 of the year 1991 to 2021 which will be a total of 124 observation. The utilization of static panel data regression is suggested in this research study to obtain more accurate results according to the number of cross-sectional units and periods used.

Therefore, the following tests were conducted. Descriptive statistics and the Jarque-Bera normality test will reveal insights about the data. To test whether the data are stationary or non-stationary, the unit root test (URT) is used in this study (Mahadeva & Robinson, 2004). Next, panel specification tests will determine the appropriate panel data analysis method of either the pooled ordinary least squares (POLS) model, Fixed-effect (FE) model or random-effect (RE) model. To develop a better and more robust panel regression model, diagnostic tests are required to detect any serious problems in the model, such as multicollinearity, heteroscedasticity and serial correlation.

Descriptive Statistical Analysis
Table 1 presents the results of the descriptive statistics of the data.

Table 1: Descriptive statistics

	LTEMP	LBROAD	LUSER	LEXP01
Mean	4.069639	-0.204241	1.893124	4.265301
Median	4.170063	0.480969	3.101476	4.230822
Maximum	4.316154	3.327541	4.573934	5.433695
Minimum	3.478779	-6.882751	-9.860428	2.852507
Std. Dev.	0.253275	2.819135	3.077264	0.729023
Skewness	-1.233058	-0.548535	-1.587270	-0.105198
Kurtosis	3.130494	2.111075	5.002834	1.930347
Jarque-Bera	31.51024	10.30104	72.79344	6.140188
Probability	0.000000	0.005796	0.000000	0.046417
Sum	504.6352	-25.32593	234.7473	528.8973
Sum Sq. Dev.	7.890231	977.5454	1164.755	65.37132
Observations	124	124	124	124

The total observation of all the variables included in the analysis which is 31 years period is 124 observations. In the analysis of LTEMP, the highest value in the range of the variable is 4.316154 where the lowest value is 3.47779 and the medium value is 4.170063. The range of LBROAD where the maximum value is 3.327541, medium value is 0.480969 and the minimum value is -6.882751. Whereas, LUSER has the highest value of 4.573934 and the lowest value of -9.860428 with a medium value of 3.101476. Lastly, the highest value for variable LEXP01 is 5.433695 while the smallest value is 2.852507 with a medium value of 4.230822.

Panel Specification Tests
In this section, a discussion of the results from three statistical tests was performed to decide which model is the most suitable for the empirical methodology of this research study which are the POLS model, FE model or RE model. Firstly, the F-test was used to choose either the POLS model or the FE model. Secondly, the Breusch

and Pagan Lagrangian Multiplier (BP-LM) test was used to decide either the POLS model or the RE model and lastly, Hausman test was utilized to select the best model between the FE model and the RE model.

Table 2: Panel Specification Test Results

Test	P-value	Null Hypothesis
F-test	0.0000	Reject
BP-LM test	0.0000	Reject
Hausman test	0.0000	Reject

Based on Table 2, the F-test result revealed that the p-value is 0.0000 < 0.05, indicating that the null hypothesis needs to be rejected. Thus, the FE model can be used to pool the panel data from the test. Nevertheless, a BP-LM test that suggested to use of the RE model instead of the null hypothesis is the outcome of rejecting the null hypothesis because the p-value is 0.000 < 0.05. As a result, the Hausman test must be performed. The results indicated that the p-value is 0.000 < 0.05, thereby the FE model is the most suitable approach, and the null hypothesis is rejected.

The results of the panel specification test demonstrated that the FE model was the most reliable panel data analysis method. Consequently, to be used in this study involves factors like economic growth, technology, and macroeconomic variables (Park, 2011). From this specification result, it addressed the third research question, which determines the suitable model for this research which is the panel data analysis.

Diagnostic Tests
To detect any serious problems regarding the dataset used in this research study, such as multicollinearity, homoscedasticity and serial correlation, the researcher has conducted diagnostics tests to identify these problems.

Table 3: Multicollinearity Test - Variance Inflation Factor (VIF)

Variables	LBROAD	LUSER	LEXP01
VIF	5.187058	5.389537	1.323368
Mean VIF = 3.96			

Table 4: Homoscedasticity and Serial Correlation Test Results

Test	P-value	Result
Heteroscedasticity	0.0000	Significant
Serial Correlation	0.0001	Significant

Based on the multicollinearity test listed in Table 3, VIFs less than 10 for each of the independent variables indicated that there is not a serious multicollinearity issue in the data (O'Brien, 2007). The tests for heteroscedasticity and serial correlation are based on Table 4. The results of both tests showed p-values which are equal to 0.0000 and 0.0001, respectively. These values were less than 0.01 proving that the results were significant and required the researcher to reject the null hypothesis of these tests. Hence, this proved that the model in this study has serious heteroscedasticity and serial correlation problems. The problems of heteroscedasticity and serial correlation can be resolved by application of fixed-effects regression with cross-section SUR and white diagonal as applied by Arellano (1987), Beck and Katz (1995), Wooldridge (2002) and Kok and Ersoy (2009) to ensure that the model will be more robust.

Findings of Panel Data
In identifying the effects of the digital economy and macroeconomic factors, such as broadband subscription, internet users and net export of goods and services on total employment of four ASEAN countries, a static panel data regression has been estimated.

Table 5: Regression Results of the Fixed-Effects Model

	Pooled Regression Model	Fixed Effect Model	Random Effect Model	Fixed Effect Model (Cross section SUR and White Diagonal
Constant	3.453506	5.139804	3.453506	4.928997
	(0.0000)	0.0000	0.0000	(0.0000)
LBROAD	0.053788	0.002802	0.053788	0.00651
	(0.0001)	0.5494	0.0000	(0.0027)
LUSER	-0.029811	0.013494	-0.029811	0.010403
	(0.0091)	0.0008	0.0000	(0.0000)
LEXP01	0.160259	-0.256755	0.160259	-0.205782
	(0.0000)	0.0000	0.0000	(0.0000)
R²	0.472911	0.956320	0.472911	0.977099
Adj. R²	0.459734	0.954080	0.459734	0.975925
F-statistic	35.88855	426.9271	35.88855	832.0031
Prob (F-statistics)	0.000000	0.000000	0.000000	0.000000
Total Observation	124	124	124	124

( ) probability value of t-statistics.

Table 5 shows the value of adjusted R^2 in this study is 0.977099 where the independent variables in this study explained 97.71% of the variation in the independent variables that impacted the dependent variable. Meanwhile, the other 2.29% is not explained in this study which might be the other variables of digitalization or any other macroeconomic factors. In the fifth column, FE model (cross-section SUR and white diagonal), the regression result showed the variable that represents the digital economy, LBROAD which is a broadband subscription has proved to have a positive significance towards the dependent variable, total employment in four ASEAN countries with the probability of p-value of 0.0027 and 0.00651. The parameters estimated that with the increase of one unit of LBROAD, the total employment (LTEMP) will improve by 0.00651 units. This significant result between variable LBROAD and LTEMP has been acknowledged by Raquel et al. (2016), Nurul (2018) and Jonas and Jonas (2019). Hence, this proved that broadband subscription has a relationship with the total employment rate in these four ASEAN countries.

Moreover, the internet user (LUSER) has a positive and statistically significant probability of p-value (0.0000) towards the total employment (LTEMP) with a coefficient of 0.010403. It explained that with an increase in LUSER by one unit, the LTEMP will increase by 0.010403 units. Therefore, there is a positively significant effect of internet users on the total employment rate in these four ASEAN countries, which is in line with previous research by Wahab et al. (2020).

Another independent variable is net export (LEXP01) is the only variable that has a negative significance towards the LTEMP as LEXP01 has a coefficient of -0.205782 with a probability p-value of 0.0000. This showed that the rise of the variable LEXP01 one unit will decrease the LTEMP by 0.205782 units. Net export of goods and services in four ASEAN countries has a negative significant effect on total employment. This result is consistent with (OECD, 2012; Kozo, 2016; Artuc et al., 2019).

5. Conclusion and Recommendations

The digital economy has significantly impacted employment in Southeast Asian countries like Indonesia, Malaysia, Singapore, and Thailand. It has created new job roles in technology, e-commerce, and digital services, such as software development, data analytics, cybersecurity, and digital marketing.

This study's results indicated that the digital economy (broadband subscription and internet users) and net exports of goods and services play a significant role in shaping the employment landscape in Indonesia, Malaysia, Singapore, and Thailand. While these factors have contributed to job creation and economic growth,

they have posed challenges, such as increased working hours, work overload, and income inequality. Therefore, efforts to ensure inclusive digital growth and equal opportunities in the digital economy are crucial. These efforts include bridging the digital divide, supporting startups, and implementing policies to ensure equal distribution of profits in the digital sector. By doing so, these countries can leverage the digital economy and net exports of goods and services to create more job opportunities and drive economic growth.

Investing in broadband infrastructure and expanding its coverage and affordability, especially in rural and remote areas, will enable more people and businesses to participate in and benefit from the digital economy. Governments can collaborate with private sector companies to build and maintain the digital infrastructure and provide incentives and subsidies to encourage investment and innovation.

Policymakers should adopt a holistic approach to trade policies that not only focuses on increasing net exports but also considers their implications for employment. Strategies aimed at promoting trade should be complemented with measures to support labor market flexibility, encourage entrepreneurship, and facilitate the transition of workers to new digital-intensive sectors. Cross-border collaboration and regional integration efforts should be intensified to leverage synergies and promote inclusive growth across Southeast Asia.

The study sheds light on the profound impact of the digital economy on employment in ASEAN countries, emphasizing the necessity for targeted policy interventions. Governments should prioritize the implementation of reskilling and upskilling initiatives to facilitate the transition of workers into newly created positions emerging from digital advancements. Investments in digital literacy and technical education are crucial in adequately equipping the future workforce for the dynamic job market. Furthermore, policies should address the precarious nature of gig economy work by enhancing labor laws and social protections, guaranteeing that gig workers receive essential benefits such as health insurance and retirement savings. Expanding broadband infrastructure, particularly in underserved areas, can further amplify job creation and economic opportunities by enabling broader participation in the digital economy.

For businesses, adapting to the digital economy entails substantial investments in technology and innovation. Companies should concentrate on digital transformation and embrace novel technologies, such as data analytics and artificial intelligence, to maintain competitiveness and foster growth. Embracing e-commerce and digital marketing strategies will enable businesses to access new markets and enhance global competitiveness. Moreover, firms must prioritize continuous employee training and development to keep pace with technological advancements and consider flexible work arrangements to attract and retain skilled personnel, particularly in a burgeoning gig economy.

From an economic perspective, while the digital economy offers prospects for job creation, it also presents challenges such as sectoral disparities and potential increases in economic inequality. Policymakers should strive to balance the benefits of digital growth across diverse sectors and address disparities by supporting industries adversely affected by trade imbalances. Strengthening regional trade agreements and reducing non-tariff barriers within ASEAN can enhance economic integration and resilience. Future research endeavors should concentrate on examining the long-term impacts of emerging technologies and sector-specific effects to refine policy approaches and support mechanisms, ensuring that the advantages of digital advancements are widely distributed.

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