THE IMPACT OF THE DIGITAL ECONOMY ON ECONOMIC GROWTH THROUGH EXPORT: EMPIRICAL STUDY IN ASEAN

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Abstract: This research examines and analyzes the impact of the digital economy on economic growth in ASEAN countries for the 2016-2022 period. This period is used because it is still in the era of the ASEAN economic community. The method used is the Generalized Moment Method. The estimation results show that exports significantly positively affect economic growth in ASEAN. This means that export activities are important to accelerate economic growth in ASEAN countries, especially in the ASEAN economic community era, so export activities need to be optimized. Furthermore, the interaction between trade and the digital economy positively relates to economic growth. This means that the digital economy can help encourage exports, so export expansion drives economic growth in ASEAN countries.

Keywords: ASEAN, GMM, economic growth, export, digital economy

Introduction

This research focuses more on ASEAN economic growth. This is because countries in the ASEAN region agreed to form the AEC (ASEAN Economic Community), namely the protocol for implementing the sixth commitment package in the field of financial services based on AFAS (ASEAN Framework Agreement on Services) which was signed by ASEAN Ministers Finance on March 20, 2015. One of the aims of establishing the AEC is to accelerate ASEAN economic growth. ASEAN economic growth declined in the AEC period due to uncertainty in global economic conditions. The impact of the AEC still does not affect economic growth at this time, because a significant impact will be seen in the long term.

The issue of digital economy as a variable capable of encouraging economic growth has been studied empirically. The digital economy is mean ICT. ICT increases the availability of information, forms new communication methods, reformats productive processes, and increases the efficiency of various economic activities, thus playing a role in encouraging accelerated economic growth (Nasab & Aghaei, 2009). ICT increases the availability of information, forms new communication methods, reformats productive processes, and increases the efficiency of various economic activities, thus playing a role in encouraging accelerated economic growth (Ortiz et al., 2015).

Technology as an input in the form of capital causes the production process to occur through investment and makes technological progress. This provides quality, competitive production results, and is produced in larger quantities, so that productivity increases, and encourages higher economic growth (Vu, 2011). Several empirical studies state that in

developing countries the use of technology is still underdeveloped. This is caused by a lack of awareness about ICT and innovation in these countries. In general, ICT in ASEAN is experiencing expansionary development, but economic growth is not in line with ICT. This means that ICT has not played a role in the economic growth of ASEAN countries. This condition occurs due to limited human resources which causes the majority of people to use ICT not for commercial activities that can improve the economy (Albiman & Sulong, 2017).

The relationship between ICT and economic growth has been widely studied. Research by Myovella et al. (2020) shows that technology has a positive effect on economic growth, especially in non-developing countries. Sepehrdoust & Ghorbanseresht (2019) researched the impact of ICT on economic growth in the OPEC region and found that ICT had an effect on economic growth but was relatively weak due to the characteristics of oil exporting countries. Likewise, the results of research by Toader et al. (2018) which show positive and significant results. However, research by Bahrini & Qaffas (2019) shows that one of four indicators hurts economic growth. Adeleye & Eboagu (2019), and Sapuan & Roly (2021) which show that ICT has a positive and significant impact on economic growth. Cheng et al. (2021) show that ICT diffusion can increase economic growth in high-income countries, but the effect is ambiguous in middle & low-income countries.

ICT can also influence economic growth through exports. There has been progress in the ICT field so that face-to-face meetings or gatherings are no longer needed because they have been replaced by telephone, email, and so on. The ICT revolution with digitalization has encouraged the creation of electronic-based commerce (e-commerce) (Debbarma et al., 2022). E-commerce continues to experience rapid growth in the world of trade because it has a significant influence as can be seen from the quantity of transactions through this facility, whether carried out business to business or business to consumer or utilized. in another form. This means that ICT reduces barriers to access to information so that international trade has better access to global markets (Nath & Liu, 2017). ICT plays a role in improving communication between countries that trade. Apart from that, high-speed internet access and the availability of a secure server have also proven to make trading activities easier. Therefore, advances in ICT can expand market share thereby increasing exports. Increasing exports also encourages economic growth or what is known as export-led growth (Felipe & Lanzafame, 2020).

The export-driven growth hypothesis theory emerged based on the trade theory of comparative advantage. The export-driven growth hypothesis assumes that export expansion is a key factor in increasing long-term economic growth (Love & Chandra, 2005). Export expansion can encourage long-term economic growth. specialization of domestically produced export products, thereby causing a reallocation of resources from the inefficient non-traded sector to the more productive export sector. This reallocation of resources can increase productivity levels, increase income, and lead to more encouraging economic growth (Tang et al., 2015), export expansion helps concentrate investment in these sectors, which in turn increases the total productivity of the economy as a whole and drives economic growth (Ee, 2016).

Sumiyarti (2015) conducted a study aimed at testing whether the "export-led growth" hypothesis applies to the Indonesian economy. The results of statistical tests can show that the alleged "export-led growth" hypothesis applies in Indonesia is acceptable. Keong, et al., (2005) the estimation results shows that exports are the cause of economic growth. Ee (2016) the results show that export led growth applies in Sub-Saharan Africa (SSA). Kalaitzi & Chamberlain (2021) demonstrated export led growth in GCC countries, such as Bahrain, Kuwait, Oman,

Saudi Arabia and the United Arab Emirates. The results provide evidence to support the validity of the ELG hypothesis in the short term for the UAE, while the opposite is true for Bahrain, Moreover, there is a bidirectional causality between exports and growth in the case of Kuwait, In the long term, the validity of the ELG is confirmed in the case of Bahrain, while economic growth leads to exports in the case of Kuwait and Saudi Arabia,

This research contributes to the empirical literature on the influence of ICT on international trade and economic growth, although empirical studies on this subject have been expanded to include global samples. This research aims to fill research gaps that obtain varying results. This research provides an update on empirical research, namely using export mediation variables with the latest data covering 2016 to 2022. In addition, the ICT index is processed separately to influence economic growth and exports. Therefore, this research can complement and strengthen empirical studies related to ICT, economic growth, and exports. Furthermore, the contribution offered in this research is to understand the impact of ICT directly on economic growth and indirectly through exports in the post-AEC ASEAN region.

Literature Review

Information and Communication Technology (ICT) is needed for economic growth and development of the country because (1) ICT can increase the speed of data transmission and a lot of information is disseminated between individuals; (2) Can reduce production costs because it is possible to access the knowledge produced at minimum costs; (3) ICT can overcome space and time constraints, resulting in increased data transmission between buyers and sellers and production processes beyond national borders; (4) Increasing market transparency followed by increasing individual demand for easy access to the necessary data (Samoilenko & Osei-Bryson, 2008). Development of ICT infrastructure by encouraging increased ICT investment to provide easy access to technology can encourage economic growth.

Advances in the use of ICT play an important role in facilitating trade. The use of ICT in trade offers several benefits such as (1) market and industry integration with transactions, distribution of goods and services that do not know the time and geographic boundaries; (2) trading cost efficiency; and (3) opening and expanding market access; and (4) accelerate business activities. The significant of the second ICT indicator variable shows that having an email and using email to contact foreign buyers has a greater influence than having a website. Hinson & Adjasi, (2009) argue that companies using the Internet have advantages and disadvantages. The advantage is that companies can reduce the costs of international information exchange which ultimately increases the possibility of new products entering export markets. Meanwhile, the weakness is that by creating a corporate website, consumers in the destination country can compare products, thereby increasing competition in the export market. This competition will cause a decrease in quality to reduce prices. Aryani et al., (2020) found that the adoption of ICT in Indonesia and the use of e-commerce in trading partners will increase Indonesia's exports to ASEAN countries. The results are similar to the findings of Lal, (2004) which shows that company performance in international markets will be better when the company adopts more advanced e-business tools in the case of Indian companies and the case of Indonesian apparel exports (Oktora & Muhtasib, 2019). Machikita et al., (2010) for the case of four ASEAN countries (Indonesia, Philippines, Thailand, and Vietnam) show that companies that use ICT in business processes are correlated with business performance, especially for export markets and improved production management.

Method

The time series data used is 7 years from 2016-2022. This time range was chosen to look at the AEC period, meanwhile, cross-section data for 9 countries in ASEAN, namely Brunei Darussalam, Cambodia, Indonesia, Laos, Myanmar, Philippines, Thailand, Malaysia, and Vietnam. The total data used in this study was 63 data. The following is a table containing brief data information

Table 1
Research Data Information

No	Variable	Variable Units	Data Source
1	Economic Growth (EG)	US dolar	World Bank
2	ICT 1	per 100 people	World Bank
3	ICT 2	per 100 people	World Bank
4	ICT 3	per 100 people	World Bank
5	ICT 4	percent (%)	World Bank
6	Export	percent (%)	World Bank

This study uses the Generalized Moment Method. Data processing in this research used STATA 17 software. The analysis model in this study is as follows:

$$lnEG_{it} = \alpha + \beta_1 lnEG_{it-1} + \beta_2 Export_{it} + e_{it} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(1)$$

$$Export_{it} = \gamma + \beta_3 Export_{it-1} + \beta_4 lnICT1_{it} + \beta_5 lnICT2_{it} + \beta_6 lnICT3_{it} + \beta_7 ICT4_{it} + e_{it} \ldots..(2)$$

$$lnEG_{it} = \delta + \beta_8 lnEG_{it-1} + \beta_9 lnICT1_{it} + \beta_{10} lnICT2_{it} + \beta_{11} lnICT3_{it} + \beta_{12} ICT4_{it} + e_{it} \ldots..(3)$$

EG, export, ICT 1, ICT 2, ICT 3, and ICT 4 are variables for economic growth, exports, Fixed broadband subscription, Fixed telephone subscription, mobile subscription, and internet. The constants α,γ,δ are the intercepts. The parameters α, γ, δ are the intercept. The parameters $\beta_1, \beta_2, \ldots., \beta_{12}$ are the coefficients of the independent variables. Variable e is the error term, then subscript i for 9 countries and subscript t for the 2016-2022 period.

Result and Discussion

Table 2
Estimation Result Equation 1

Variable	FD-GMM		SYS-GMM	
	One Step	Two Step	One Step	Two Step
LnEG$_{it-1}$	0,0675**	0,2098	0,1695**	0,1456**
	(0,0345)	(0,2217)	(0,1025)	(0,1227)
Export	0,0078*	0,0344**	0,0078*	0,0156**
	(0,3259)	(0,1228)	(0,3259)	(0,1228)
AR(1)	0,0831*	0,0731*	0,0831*	0,1281
AR(2)	0,0667*	0,0767*	0,0667*	0,2797
Sargan Test	0,0546*	0,0846*	0,0546*	0,8896
Hansen Test	0,9872	0,6872	0,9872	0,8492

Note: ***, **, * significant at 1%, 5%, 10% , and (….) is standart error

Table 2 shows the results of estimating equation 1 using the First Difference GMM and System GMM methods. The estimation results of one-step and two-step FD-GMM and one-step SYS-GMM are invalid because the AR(1) and AR(2) probabilities as well as the Sargan

test probability are below the 10 percent level. Therefore, the three GMM approaches cannot be analyzed further. The SYS-GMM approach is better than the three previous approaches because based on GMM assumptions the SYS-GMM approach is valid. The probability of AR(1), AR(2), Sargan test, and Hansen test is above 10 percent. Furthermore, the lag variables of economic growth and exports of goods and services have a significant positive effect on ASEAN economic growth. The export coefficient is 0.0786, meaning that an increase in exports of 1 percent means economic growth will increase by 1.57%. This means that the export-led growth hypothesis in ASEAN in the AEC era is valid. Therefore, during the AEC, countries in the ASEAN region must optimize bilateral export-import activities between ASEAN countries.

Table 3
Estimation Result Equation 2

Variable	FD-GMM		SYS-GMM	
	One Step	**Two Step**	**One Step**	**Two Step**
Export_{it-1}	0,1235** (0,1275)	0,1008* (0,0214)	0,2105** (0,0125)	0,0276** (0,1027)
lnICT 1	0,0288* (0,1269)	0,0544** (0,0228)	0,0128* (0,1279)	0,0222** (0,2228)
lnICT 2	0,0895** (0,2135)	0,1058** (0,0287)	0,1211** (0,0148)	0,0366** (0,1107)
lnICT 3	0,0898* (0,0251)	0,0392** (0,0778)	0,0358* (0,1271)	0,0178** (0,1388)
ICT 4	0,0945** (0,0441)	0,2139 (0,3218)	0,2663** (0,0227)	0,0425** (0,2217)
AR(1)	0,0671*	0,0932*	0,0991*	0,2389
AR(2)	0,0877*	0,0821*	0,0786*	0,3747
Sargan Test	0,0766*	0,0612*	0,0756*	0,6797
Hansen Test	0,0874*	0,0624*	0,0888*	0,6499

Note: ***, **, * significant at 1%, 5%, 10% , and (….) is standart error

   Table 3 shows the results of estimating equation 2 using the First Difference GMM (FD-GMM) and System GMM (SYS-GMM) methods. The estimation results of one-step and two-step FD-GMM and one-step SYS-GMM are invalid because the AR(1) and AR(2) probabilities as well as the Sargan test and Hansen test probability are below the 10 percent level. Therefore, the three GMM approaches cannot be analyzed further. The SYS-GMM approach is better than the three previous approaches because based on GMM assumptions the SYS-GMM approach is valid. The probability of AR(1), AR(2), Sargan test, and Hansen test is above 10 percent. Furthermore, the lag variables of exports of goods and services, ICT1, ICT2, ICT3, and ICT4 have a significant positive effect on ASEAN exports of goods and services. These estimation results mean that optimizing ICT for export activities is necessary because it can increase exports in the ASEAN region. The ICT 4 coefficient is the largest compared to other ICT indicators. An increase in ICT 4 by 1 percent will increase exports by 0.04 percent.

   Touati & Aljazea, (2023) examined the impact of ICT on exports in 19 MENA countries from 2005 to 2019. The results are as follows: The Information and Communication Technology Development Index has a negative and statistically significant effect on exports. Oktora & Muhtasib, (2019) conducted research in Indonesia. This research aims to analyze the influence of ICT on Indonesian apparel exports to ten main trading partners during the 2010-2016 period using a gravity model on panel data. The research results show that ICT in export destination countries has a significant effect on Indonesian apparel exports, while Indonesian ICT provides significant results. Chu & Guo (2019) conducted more detailed research by examining the influence of ICT applications on China-ASEAN trade activities. The research

concludes that ICT has a positive and significant impact on international trade between China and ASEAN. Ozcan, (2018) also examined the influence of ICT on Turkey's international trade using a gravity model. The research concludes that ICT has a positive and significant influence on Türkiye's export volume. This proves that reliable use of ICT is a crucial factor in increasing export volume.

Table 4
Estimation Result Equation 3

Variable	FD-GMM		SYS-GMM	
	One Step	Two Step	One Step	Two Step
$LnEG_{it-1}$	0,1825**	0,1238*	0,2375**	0,0816**
	(0,1345)	(0,1234)	(0,1175)	(0,1428)
lnICT 1	0,0748*	0,0745**	0,0139*	0,0172**
	(0,1379)	(0,0168)	(0,1819)	(0,3148)
lnICT 2	0,0395**	0,1258**	0,1710**	0,0568**
	(0,3145)	(0,0347)	(0,0136)	(0,1327)
lnICT 3	0,0918*	0,0312**	0,0157*	0,0189**
	(0,0231)	(0,0716)	(0,1282)	(0,1578)
ICT 4	0,0744**	0,2049	0,2173**	0,0875**
	(0,0491)	(0,3368)	(0,0345)	(0,2021)
AR(1)	0,0551*	0,0733*	0,0904*	0,5387
AR(2)	0,0678*	0,0624*	0,0992*	0,3748
Sargan Test	0,0676*	0,0679*	0,0856*	0,4787
Hansen Test	0,0812*	0,0890*	0,0928*	0,4495

Note: ***, **, * significant at 1%, 5%, 10% , and (….) is standart error

Table 3 shows the results of estimating equation 2 using the First Difference GMM (FD-GMM) and System GMM (SYS-GMM) methods. The estimation results of one-step and two-step FD-GMM and one-step SYS-GMM are invalid because the AR(1) and AR(2) probabilities as well as the Sargan test and Hansen test probability are below the 10 percent level. Therefore, the three GMM approaches cannot be analyzed further. The SYS-GMM approach is better than the three previous approaches because based on GMM assumptions the SYS-GMM approach is valid. The probability of AR(1), AR(2), Sargan test, and Hansen test is above 10 percent. Furthermore, the lag variables of exports of goods and services, ICT1, ICT2, ICT3, and ICT4 have a significant positive effect on ASEAN exports of goods and services. These estimation results mean that optimizing ICT for economic growth in the ASEAN region. The ICT 4 coefficient is the largest compared to other ICT indicators. This means that the Internet has the greatest influence on the performance of exports of goods and services in the ASEAN region. An increase in ICT 4 (internet use) by 1 percent will increase exports by 0.08 percent.

Conclusion

The estimation results show that ICT 1, ICT 2, ICT3, and ICT4 have a significant effect on economic growth and exports of goods and services in the ASEAN region. Apart from that, exports of goods and services also have a significant effect on economic growth. Therefore, exports can be a mediating variable for ICT to influence economic growth. The export-led growth hypothesis also applies in the ASEAN region. The policy recommendation given is to optimize exports of goods and services by improving the quality of exports of goods and services.

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