

INVESTIGATION OF FINANCIAL INCLUSION, FINANCIAL TECHNOLOGY, ECONOMIC FUNDAMENTALS, AND POVERTY ALLEVIATION IN ASEAN-5: USING SUR MODEL

Lia Nazliana Nasution^{1,*}, Ramli², Isfenti Sadalia³, and Dede Ruslan⁴

Abstract

This study investigated the effect of financial inclusion and fintech on economic fundamentals and poverty rates in five developing countries in ASEAN (ASEAN-5) using the Seemingly Unrelated Regression (SUR) model during the period 2009 to 2019. The results obtained are: (1) Financial inclusion through the credit variable and the number of ATMs, and fintech through the e-money variable, contributed to the most significant increase in GDP in the ASEAN-5 countries. Meanwhile, the most critical contributor to reduction in the unemployment rate from financial inclusion is through the credit and savings variables, while from fintech it is through mobile phone subscriptions. (2) Thailand is the country that has most effectively influenced the economic fundamental of unemployment rate, while Indonesia is the country that has most effectively influenced the economic fundamental of GDP. The results obtained from the panel regression model and cross-sectional weighting indicate that financial inclusion through savings, credit, and number of ATMs, and fintech through cellular phone subscription, are effective in reducing poverty rates in the ASEAN-5 countries. Nevertheless, financial inclusion and fintech do not significantly affect the inflation rate.

Keywords: Financial inclusion; financial technology; economic fundamentals; poverty

1. INTRODUCTION

Economic fundamentals form the basis of economic activity. In analyzing the factors that affect the fundamental condition of a country's economy, economic indicators are difficult to separate and are an essential part of the overall fundamental factor itself. The indicators often used for fundamental economic analysis are GDP, economic

growth, inflation rate, and fiscal conditions, among others (Budiyanti & Lisnawati, 2010).

ASEAN is a region with strong economic fundamentals. In 2019, the combined total GDP of the ten ASEAN member countries was USD 3.2 trillion. This condition places ASEAN as the fifth largest economy in the world. However, GDP growth has slowed in recent years due to various challenges, both external and domestic (Figure 1). One of these

^{1,*} Lia Nazliana Nasution, S.E., M.Si is currently working as a lecturer at the Department of Development Economics, Universitas Pembangunan Panca Budi Medan, Indonesia. She obtained a master's degree in Medan from Universitas Sumatera Utara, Indonesia. Email: lianazliana@dosen.pancabudi.ac.id

² Prof. Dr. Ramli, S.E, MS is currently working as a lecturer at the Department of Development Economics, Faculty of Economics and Business, Universitas Sumatera Utara Medan, Indonesia. He obtained a Ph.D in Surabaya from Airlangga University, Indonesia.

³ Prof. Dr. Isfenti Sadalia, S.E., M.E is currently working as Head of the Master of Management Study Program at Universitas Sumatera Utara Medan, Indonesia. She obtained a Ph.D in Surabaya from Airlangga University, Indonesia.

⁴ Dr. Dede Ruslan, M.Si is currently working as the Head of the Department of Economics, Faculty of Economics, Universitas Negeri Medan, Indonesia. He obtained a Ph.D in Bandung from Padjadjaran University, Indonesia.

challenges is the uncertainty of global financial markets (bi.go.id, 2016).

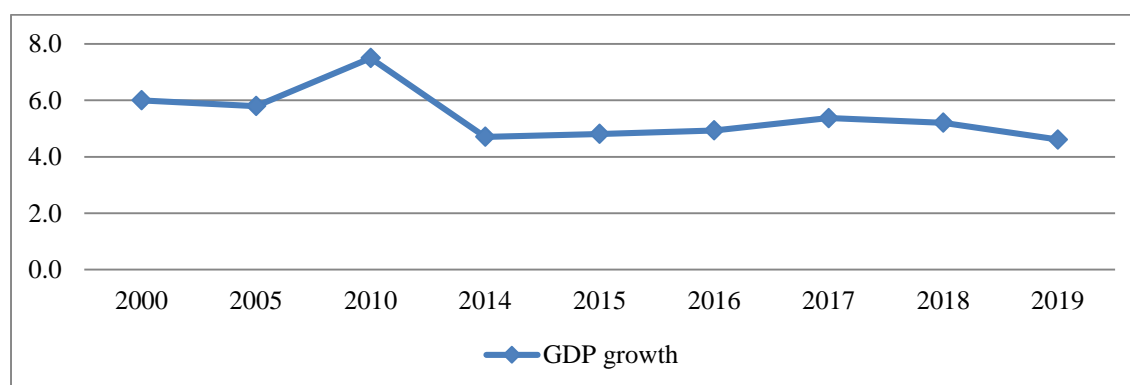
The financial sector has a decisive influence in the economy (Levine, 2004) as it creates capital accumulation and technological innovation, further increasing economic growth (Fabya, 2011). The financial sector is one of the industrial sectors experiencing the development of information and communication technology (ICT). The banking industry relies on ICT for services to its customers, such as mobile banking and internet banking (Kominfo, 2019). The public has also begun to get used to digital technology-based financial services or what is known as fintech (financial technology).

The presence of fintech is believed to encourage increased financial inclusion (Giwa-Osagie et al., 2020) as the unbanked community can obtain alternative financial services through fintech (MediaIndonesia, 2019). Fintech's contribution has helped many people still not served by formal financial institutions to conduct financial transactions according to their needs (Marginingsih, 2021). Over the past decade, 1.2 billion previously unbanked adults gained access to financial services, and the unbanked population fell 35% due to an increase in mobile money accounts. Globally 1.7 billion adults remain unbanked; fintech is helping to make financial services more accessible to a growing number of people (Appaya, 2021).

Financial inclusion is defined as the existence of broad access to various financial services and products to increase welfare

(UNCDF, 2020). Various previous works of literature have discussed the influence of financial inclusion and fintech on economic growth and poverty. Among others, Hariharan & Marktanner (2012), Iqbal & Sami (2017) and Mwaitete & George (2018), have revealed that an increase in financial inclusion would be reflected in economic growth. Bakari et al. (2019), Hussaini & Chibuzo (2018), and Park & Mercado (2015) found that financial inclusion has an impact on poverty alleviation. Mwinzi (2014) explained that the fintech of mobile money and clearing has a significant impact on economic growth in Kenya. Financial inclusion can create positive externalities in the economy as it allows more effective implementation and transmission of monetary policy (Mehry, Ashraf, & Marwa, 2021), while fintech can also influence inflation rates in the short term (Saraswati, Maski, & Kaluge, 2020).

However, globally, about 2 billion people still do not use formal financial services (Luna-Martinez, 2016). In ASEAN, 265 million or 44 percent of adults still do not have a bank account (UNCDF, 2020). This is a challenge for ASEAN, considering that financial inclusion is an essential matter for economic and social development and is one of ASEAN's priorities for the next five years (Luna-Martinez, 2016). Likewise, with the use of fintech among ASEAN countries. The Global Findex Database, in the publication of the book entitled "The little data book of financial inclusion 2018", presents data for



Source: ASEAN Secretariat, ASEAN StatsDataPortal

Figure 1. ASEAN Real GDP Growth Rate, 2000 – 2019

Table 1. Fintech developments in ASEAN-5 (2018)

Criteria	Malaysia	Thailand	Philippines	Indonesia	Vietnam
Make or receive digital payments	70.4	62.3	25.1	34.6	22.7
Using the account to receive private-sector wages	20.5	12	6.6	5.9	8.9
Using the internet to pay bills/buy online	38.8	18.7	9.9	11.2	20.5
Using mobile/internet to access account	32.6	17.4	7	7.7	9.2

Source: Global Findex Database

Table 2. World bank financial inclusion indicators in ASEAN-5 (2014)

Indicator	Malaysia	Thailand	Philippines	Indonesia	Vietnam
Account	81%	78%	31%	36%	31%
Borrowings	56%	50%	70%	57%	47%
Mobile account	3%	1%	4%	0.4%	0.5%
Insurance	16%*	24%*	5%*	0.9%*	18%*
Savings	82%	81%	67%	69%	63%

Source: (Demirguc-Kunt, L., Singer, & Van Oudheusden, 2015)

Note: All respondents are aged 15 plus. * denotes that data is only available for the year 2011.

indicators of how people make or receive digital payments in ASEAN (see Table 1) (World Bank, 2018). Malaysia and Thailand are high in the use of fintech, in contrast to the Philippines, Indonesia, and Vietnam, which are still far below in their use of fintech.

Furthermore, Table 2 indicates World Bank's assessment of financial inclusion in ASEAN in 2014. Malaysia ranked the highest with bank accounts and savings at 81 percent and 78 percent respectively, followed by Thailand, while the Philippines, Indonesia, and Vietnam, had much lower values of around 30 percent. The highest percentage who reported borrowing money for any reason and from any source was the Philippines, while the lowest was Vietnam. The percentage of people using cell phones to pay bills or send/receive money was the highest in the Philippines. The highest use of health insurance was in Thailand, with the highest amount for savings being Malaysia, followed by Thailand.

From various phenomena indicated in the previous literature, the data explained above, and the current gaps in the level of financial

inclusion and use of fintech, this study aims to investigate the effect of financial inclusion and fintech on economic fundamentals and poverty rates in five developing countries in ASEAN (ASEAN-5). The indicators of the fundamental economic variables used are the unemployment rate, inflation, and GDP.

2. LITERATURE REVIEW

2.1 Financial Inclusion

The World Bank distinguishes between people who receive formal financial services (financial inclusion) and those who do not (financial exclusion). Formal services include having access to financial services from a bank or other formal provider. Financial services include formal services and services from informal providers (i.e., other organized financial service providers). On the other hand, the term 'financially excluded' describes individuals who have no access (Group, 2006).

Financial inclusion is the provision of access to a variety of safe and affordable

financial services that meet the needs of all levels of society, including low-income groups of rural people, at affordable costs (FATF, 2011).

Financial inclusion is proven to be able to increase economic growth (Babajide, Adegboye & Omankhanlen, 2015; Hariharan & Marktanner, 2012; Iqbal & Sami, 2017; and Williams, Adegoke & Dare, 2017), reduce poverty (Andrian, Sitorus & Chandra, 2021; Bakari et al., 2019; Hussaini & Chibuzo, 2018; Park & Mercado, 2015; and Zia & Prasetyo, 2018), reduce unemployment (Okoro, Obiekwe, & Okoro, 2020), and reduce inflation (El Sherif, 2019; and Lenka & Bairwa, 2016).

On the other hand, Ductor (2015) found an interdependence between the financial sector and real sector technology, which is a sign of the effect of financial sector growth on GDP growth. Furthermore, Ductor revealed that financial developments harmed economic growth when it was not accompanied by growth in the real sector of the economy. Ayensu (2017) also found that financial inclusion has not had a substantial impact on poverty reduction in Sub-Saharan Africa. Access to finance had no significant effect on poverty reduction in a select few Sub-Saharan African countries. However, domestic banks' credit to the private sector (financial depth) did significantly reduce poverty.

2.2 Financial Inclusion Indicator

Several studies among the literature examine financial inclusion using multiple indicators. The indicator of financial inclusion refers to three dimensions, namely access, usage, and quality of banking services (bi.go.id, 2019). The access dimension relates to the reach of financial services as depicted through the number of ATMs, and bank branch offices, while the usage dimension relates to the use of financial products such as the amount of savings, and credit, and the number of depositors, and borrowers (bnm.gov.my, 2018). The dimension of quality is related to the availability of financial products in meeting the needs of the

community.

Previous research has used various indicators to describe financial inclusion, including the number of bank branches per 100,000 adults (Iqbal & Sami, 2017; Joseph & Varghese, 2014; Mwaitete & George, 2018; Nasution, Sari & Dwilita, 2013; Nasution, Efendi, Sari, Novalina, Nasution & Sembiring, 2019; Siddik, Ahsan & Kabiraj, 2019; Park & Mercado, 2015; Wang'oo, 2013; and Zia & Prasetyo, 2018), the number of commercial bank branches per 1,000 km² (*Siddik, Ahsan, & Kabiraj, 2019*), use of debit and credit cards (*Joseph & Varghese, 2014*), number of ATMs (Bakari et al., 2019; Iqbal & Sami, 2017; Joseph & Varghese, 2014; Julie, 2013; Mwaitete & George, 2018; Park & Mercado, 2015; and Wang'oo, 2013), savings (Bakari et al., 2019; Nasution, Efendi, Sari, Novalina, Nasution & Sembiring, 2019; Ravikumar, 2013; Siddik, Ahsan & Kabiraj, 2019; Wang'oo, 2013; and Zia & Prasetyo, 2018), credit (Bakari et al., 2019; Iqbal & Sami, 2017; Ravikumar, 2013; Siddik, Ahsan & Kabiraj, 2019; Park & Mercado, 2015; and Zia & Prasetyo, 2018), number of mobile money accounts (Hariharan & Marktanner, 2012; Julie, 2013; and Mwaitete & George, 2018), commercial bank depositors (Park & Mercado, 2015), the number of loan accounts at commercial banks per 1000 adults, and micro-fund depositing institutions (*Mwaitete & George, 2018*).

2.3 Financial Technology

Fintech refers to the use of digitalization and other technology in facilitating financial sector activities, ultimately changing business models, payment activities, and transactions from conventional to moderate (bi.go.id, 2018). Fintech is also defined as technological innovation in financial services, leading to new business models, applications, processes, or products with material effects related to providing financial services (FSB, 2017).

Fintech is trusted to assist in both buying and selling transactions, while payment systems have also become more efficient and

Table 3. Research Variables

Variable Indicator	Variable Indicator
Financial inclusion	Number of commercial bank branches (per 100,000 adults)
	Number of ATMs (per 100,000 adults)
	Net national savings (% of GNI)
	Domestic credit provided by the financial sector (% of GDP)
Financial technology	e-money transaction volume
	Mobile cellular subscriptions (per 100 people)
Economic fundamental	Unemployment, total (% of the total labor force)
	GDP (constant price)
	Inflation, consumer prices (percent)
Poverty	Percentage of people below the poverty line (percent)

economical. For the community, the existence of fintech provides many benefits, such as receiving better services, having greater choices, and lower prices. For fintech players, fintech simplifies the transaction chain, reduces operational and capital costs, and freezes the flow of information. At the State level, the existence of fintech encourages the transmission of economic policies, increases the speed of money circulation, and improves the community's economy. The development of financial technology, on the one hand, has been proven to bring benefits to consumers, business actors, and the national economy, but on the other hand, it has potential risks that can destabilize the financial system (bi.go.id, 2020).

3. RESEARCH METHODOLOGY

3.1 Data

Quantitative secondary data from an 11-year observation period (2009-2019) were used to match the purpose of the study. Data were sourced from the World Bank. The main variables of the study were financial inclusion, fintech, economic fundamentals, and poverty levels (see Table 3).

3.2 Estimation Technique

The research model used a Seemingly Unrelated Regression (SUR) with Feasible

Generalized Least Square (FGLS) estimation technique. The research stages were (1) simple panel data regression modeling, (2) model specification with Chow test and Hausman test, (3) a residual structure test of the model via heteroscedasticity and peer correlation, (4) SUR modeling with FGLS estimation, (5) measuring the goodness of fit of the model, (6) SUR assumption test (normality and heteroscedasticity), and (7) model interpretation.

3.3 Seemingly Unrelated Regression (SUR)

The SUR system of equations introduced by Arnold Zellner (1962) contains a set of unrelated equations. The variables are not two-way, but between equations, there is a correlation between errors known as peer correlation. The system of linear equations of several regression equations can be solved into one set of equations to obtain efficient parameters with SUR. The equations for the SUR modeling used in this study are:

$$UNEMP_{it} = \alpha_0 + \alpha_1 KACAB_{it} + \alpha_2 TAB_{it} + \alpha_3 CREDIT_{it} + \alpha_4 ATM_{it} + \alpha_5 EMONEY_{it} + \alpha_6 CELL_{it} + e_1 \quad (1)$$

$$GDP_{it} = \beta_0 + \beta_1 KACAB_{it} + \beta_2 TAB_{it} + \beta_3 CREDIT_{it} + \beta_4 ATM_{it} + \beta_5 EMONEY_{it} + \beta_6 CELL_{it} + e_2 \quad (2)$$

$$INF_{it} = \gamma_0 + \gamma_1 KACAB_{it} + \gamma_2 TAB_{it} + \gamma_3 CREDIT_{it} + \gamma_4 ATM_{it} + \gamma_5 EMONEY_{it} + \gamma_6 CELL_{it} + e_3 \quad (3)$$

$$POV_{it} = \delta_0 + \delta_1 KACAB_{it} + \delta_2 TAB_{it} + \delta_3 CREDIT_{it} + \delta_4 ATM_{it} + \delta_5 EMONEY_{it} + \delta_6 CELL_{it} + \delta_7 UNEMP_{it} + \delta_8 GDP_{it} + \delta_9 INF_{it} + e_4 \quad (4)$$

Where:

KACAB = Number of commercial bank branches per 100,000 adults in the population,

TAB = Net national savings (% of GNI),

CREDIT = Domestic credit provided by the financial sector (% of GDP),

ATM = The number of ATMs per 100,000 adults in the population,

EMONEY = e-money transaction volume,

CELL = Mobile cellular subscriptions per 100 people in the population,

UNEMP = Total unemployment as % of the total labor force,

GDP = country level GDP (constant price),

INF = Inflation of consumer prices (percentage),

POV = Percentage of people living below the poverty line (percentage),

and where α , β , γ , and δ are coefficients, ‘i’ is the number of observations (five countries), ‘t’ is the observation period (2009 – 2019), and ‘e’ is the error term.

3.4 Model Verification

Before application of the SUR method, it is necessary to first perform a panel data regression, following the Common Effect, Fixed Effect, and Random Effects approach. This test is conducted by

separating financial inclusion and financial technology variables. The summary of the eight-panel regression output equations is as shown in Table 4.

The results from each equation under the various models are indicated in the panel regression summary in Table 4. Heteroscedasticity and equivalence correlation exists between errors in the first and fifth equations, indicating that the selected panel regression estimation model (fixed effect) is not appropriate. Therefore, this analysis was followed by use of the SUR model with FGLS estimation. In the second and sixth equations, the variance of the residuals was homogeneous, but there was also an equivalence correlation between the errors. This indicates that estimation via the FGLS estimation SUR model is the more appropriate method.

There is a heteroscedasticity problem in the third and seventh equations, but no equivalence between the errors. Therefore, use of the fixed-effect model with cross-sectional weight in the GLS estimate, was an appropriate method. Meanwhile, in the fourth and eighth equations, the variance of the residuals was homogeneous, with no equivalence correlation between the errors. Therefore, the selected panel regression estimation model could still be used.

Table 4. Summary of Panel Regression Results

Criteria	I (UNEMP)	II (UNEMP)	III (INF)	IV (INF)	V (GDP)	VI (GDP)	VII (POV)	VIII (POV)
Selected Panel Regression Estimate	Fixed Effect	Random Effect	Fixed Effect	Random Effect	Fixed Effect	Fixed Effect	Fixed Effect	Fixed Effect
Heteroscedasticity	There is a heteroscedasticity problem	Homogeneous residuals	There is a heteroscedasticity problem	Homogeneous residuals	There is a heteroscedasticity problem	Homogeneous residuals	There is a heteroscedasticity problem	Homogeneous residuals
Contemporaneous Correlation	There is a contemporaneous correlation	There is a contemporaneous correlation	There is no contemporaneous correlation	There is no contemporaneous correlation	There is a contemporaneous correlation	There is a contemporaneous correlation	There is no contemporaneous correlation	There is no contemporaneous correlation
Model Conclusion	SUR	SUR	Cross-section weight	Random Effect	SUR	SUR	Cross-section weight	Fixed Effect

Source: Eviews 10.0, Processed by the author

4. RESULTS AND DISCUSSION

Table 5. SUR Results

Variables	Equation I (UNEMP): Coefficient (Prob.)				
	Indonesia	Philippines	Vietnam	Malaysia	Thailand
KACAB	-0.126 (0.000)***	1.329 (0.003)***	0.235 (0.002)***	0.153 (0.418)	-0.513 (0.000)***
TAB	-0.0009 (0.651)	0.018 (0.057)	-0.04 (0.000)***	-0.03 (0.000)***	-0.011 (0.03)***
CREDIT	0.081 (0.015)***	-0.031 (0.000)***	-0.017 (0.000)***	-0.026 (0.000)***	-0.005 (0.019)***
ATM	-0.026 (0.002)***	-0.235 (0.000)***	0.168 (0.000)***	-0.026 (0.169)	0.022 (0.003)***
EMONEY	5.02E-10 (0.322)	-1.02E-05 (0.000)***	9.07E-07 (0.015)***	0.0002 (0.01)***	4.50E-06 (0.02)***
CELL	-0.02 (0.000)***	0.002 (0.718)***	0.0015 (0.782)	-0.014 (0.000)***	-0.007 (0.04)***
Intercept	4.519 (0.000)***	-2.248 (0.349)	0.892 (0.000)***	7.764 (0.000)***	5.737 (0.000)***
R²	0.9382	0.9643	0.9267	0.6793	0.5879

***Significant at = 5%

Source: Eviews 10.0, Processed by the author

Variables	Equation II (GDP): Coefficient (Prob.)				
	Indonesia	Philippines	Vietnam	Malaysia	Thailand
KACAB	-21.1 (0.000)***	-21.527 (0.217)	1.81 (0.827)	-16.17 (0.745)	-29.49 (0.004)***
TAB	2.665 (0.000)***	-0.22 (0.599)	-0.538 (0.303)	3.226 (0.04)***	0.16 (0.649)
CREDIT	19.645 (0.000)***	1.998 (0.000)***	0.566 (0.01)***	1.646 (0.241)	0.09 (0.573)
ATM	5.327 (0.000)***	9.152 (0.000)***	6.89 (0.000)***	-20.68 (0.00)***	3.26 (0.000)***
EMONEY	6.86E-07 (0.000)***	0.0008 (0.000)***	0.0001 (0.000)***	0.133 (0.0001)***	0.0003 (0.005)***
CELL	3.094 (0.000)***	0.63 (0.116)	0.332 (0.000)***	0.335 (0.76)	0.852 (0.000)***
Intercept	-60.55 (0.687)	140.97 (0.1481)	-62.37 (0.013)***	1196.86 (0.02)***	379.91 (0.000)***
R²	0.9812	0.9927	0.9539	0.8392	0.9837

***Significant at = 5%

Source: Eviews 10.0, Processed by the author

The results of the Seemingly Unrelated Regression show that both financial inclusion and Fintech have an essential role in strengthening the economic fundamentals of the ASEAN-5 as proxied through UNEMP and GDP. Based on the dimensions of access and use, financial inclusion significantly affects the unemployment rate and GDP. These results are in line with research conducted by Babajide, Adegboye & Omankhanlen (2015), Igbal & Sami (2017), and Mwaitete & George (2018).

A significant negative relationship was found between the number of bank branches and unemployment rates in Indonesia and Thailand. The two countries indicate that

many people still prefer to go directly to financial institutions such as banks, especially in rural communities, for cash deposits and opening new accounts. In addition, people also come to the bank to apply for business capital loans. Therefore, an increasing number of new bank branch offices expands the absorption of labor, ultimately reducing the unemployment rate (Economist, 2011).

Meanwhile, in the Philippines and Vietnam, bank branches have a significant positive relationship with the unemployment rate. This means that when the number of bank offices increases, unemployment also increases. In Malaysia, no meaningful relationship could be found. When

considering the data of the number of bank branch offices, these three countries tended to have a decrease in number. Due to the increasing number of online banking services and increase in mobile banking, there is no need for additional bank branches.

The dimension of financial inclusion, namely net national savings, made an essential contribution to reducing unemployment rates in Vietnam, Malaysia, and Thailand. Mobilizing savings destined for investment and allocating credit financing to the real sector, opens up business opportunities in the market. When the domestic financial sector is strong, it can drive the necessary transformations to develop and integrate the economic sector with a tremendous potential to generate decent and productive jobs that provide good job prospects (Osikena & Uğur, 2016). However, in Indonesia and the Philippines, savings do not affect the unemployment rate significantly as, in the era of digitalization, non-banking people do not need to have an account at a bank.

Another finding is that the credit variable has a significant negative correlation to the unemployment rate in the Philippines, Vietnam, Malaysia, and Thailand. This finding is consistent with prior research (Mehry, Ashraf, & Marwa, 2021). An increase in the number and value of loans disbursed, increases the business capital of the people, in turn increasing the number of jobs and decreasing unemployment. Financial inclusion facilitates access to financial services, particularly credit, enabling entrepreneurs to initiate their businesses and facilitating business growth, sequentially lowering the unemployment rate as new companies grow. Hence more unemployed citizens become employed.

However, credit does not significantly affect the unemployment rate in Indonesia as credit disbursement occurs mainly for the purpose of consumption. Based on Indonesian Banking Statistics, in 2019, the portion of consumption credit was 25,430 billion Rupiah, significantly greater than the portion of working capital credit, which was only

15,228 billion Rupiah, while investment credit was only 4,800 billion Rupiah (OJK, 2021). Ideally, an increase in public consumption should be accompanied by an increase in working capital credit, as this leads to growth in the real sector and increased demand for workers.

Likewise, financial inclusion from the perspective of access, specifically the number of ATMs, has a significant negative relationship to the unemployment rate in Indonesia and the Philippines. This result supports prior research (Fadun, 2014) which found that increasing access to financial services would positively impact investment and job creation and improve the people's income. As stated in the Economist (2011), an increase in ATMs creates new jobs such as ATM maintenance officers. However, in some countries, ATMs are managed directly by the banks so that the high and low number of ATMs does not affect the unemployment rate, such as in Vietnam, Thailand, and Malaysia.

Regarding the effect of financial inclusion on economic fundamentals in terms of GDP, the findings for Indonesia show that savings, credit, and the number of ATMs have a significant positive relationship with GDP. This positive relationship shows that financial inclusion contributes to the GDP of the ASEAN-5. These findings are consistent with those of Iqbal & Sami (2017), Kim, Yu & Hassan (2018), Masih & Peters (2010), Siddik, Ahsan & Kabiraj (2019), Singh (2010) and Van, Vo, Nguyen & Vo (2019). By increasing access to financial services and increasing the financial capacity to use these services effectively, communities can invest in their education to increase their potential for employment or create jobs by financing their income-generating projects (Sykes, Elder, Gurbuzer, & Principi, 2016). Likewise, in the Philippines and Vietnam, financial inclusion in terms of both access and use increases the country's GDP.

In Malaysia, it has been determined that the number of ATMs has a significant negative impact on GDP. This result contradicts the theory but aligns with prior

research (Iqbal & Sami, 2017; and Mwaitete & George, 2018). Meanwhile, credit does not significantly affect GDP in Malaysia due to the common incidence of bad credit related to car purchases that caused consumer bankruptcy between 2011 and 2016 (Kompas.com, 2016). This situation has meant that the growth in credit that occurred could not contribute to Malaysia's state income.

On the other hand, the results of this study found that Fintech significantly affects economic fundamentals in terms of the unemployment rate. Mobile phone subscriptions have a significant negative relationship with unemployment rates in Indonesia, Malaysia, and Thailand. These findings are in line with the research of Bojnec & Fertoe (2009), Ebaidalla (2015), and Shabbir, Kousar & Alam (2019). Mobile phone subscriptions increase online shopping and increase the speed of money transactions via mobile applications, leading to more jobs in the Information and Communication Technology (ICT) sector, and resulting in a decrease in the unemployment rate (Shabbir, kousar, & Alam, 2019). In Indonesia itself, the phenomenon of online shopping has boomed in recent years. People tend to prefer online shopping as it is more effective, time-saving, and the costs incurred are also more

efficient as customers do not need to come in person. Furthermore, Ebaidalla (2015) also revealed that technological processes reduce youth unemployment as new technologies can increase productivity and produce new activities that absorb the unemployed workers.

The results also found a significant positive relationship between GDP growth and the volume of e-money transactions in the five ASEAN countries. This positive relationship also explains that an increase in e-money transactions through financial technology stimulates growth in the GDP of the ASEAN-5. This finding is supported by the results of a prior study by Mwaitete & George (2018). Likewise, fintech, via mobile phone subscriptions, contributes significantly to GDP in Indonesia, Vietnam, and Malaysia.

These findings are in line with studies conducted by Aziz & Athoillah (2019), Migap, Okwanya & Ojeka (2015) and Mwinzi (2014), which indicated that the development of fintech to provide mobile money payments and mobile transfer services, contributes positively to GDP and stimulates growth in the financial sector. This is in line with the theory of endogenous evolution by Paul M. Romer (1994), which states that the potential for economic growth, in the long run, is driven by technology and

Table 6. Results of Cross-Sectional Weight and Estimated Regression of Selected Panels

Variable		Cross-section Weight (INF)	Random Effect (INF)	Cross-section Weight (POV)	Fixed Effect (POV)
Financial Inclusion	KACAB	0.276 (0.043)***		0.244 (0.296)	
	TAB	-0.021 (0.096)		-0.068 (0.0002)***	
	CREDIT	-0.024 (0.2625)		-0.058 (0.013)***	
	ATM	-0.035 (0.204)		-0.26 (0.000)***	
Financial Technology	EMONEY		-4.33E-09 (0.3767)		3.42E-09 (0.728)
	CELL		-0.007 (0.64)		-0.107 (0.0009)***
Economic Fundamentals	UNEMP			0.807 (0.486)	0.997 (0.453)
	INF			0.113 (0.467)	0.443 (0.019)***
	GDP			0.007 (0.082)	-0.012 (0.3)
R²		0.5788	0.022	0.953	0.9037
Prob. (F-stat)		0.000***	0.5515	0.000***	0.000***

***Significant at = 5%

Source: Eviews 10.0, Processed by the author

innovation (Romer, 1994).

The selected panel regression estimates, with and without cross-sectional weighting, show that financial inclusion and fintech do not significantly affect economic fundamentals in terms of inflation. The variables of financial inclusion and fintech are negatively related to inflation rate. This indicates that financial inclusion and fintech can reduce inflation in the ASEAN-5. However, the relationship is not significant, possibly because few people use banking products and the low number of people who make digital payments, in the end, make inflation control in the ASEAN-5 less effective. This finding aligns with the work of Dupas, Keats & Robinson (2013) and Khan (2011).

The number of bank branches has a significant positive effect on the inflation rate, showing that the more bank branches there are, the higher the inflation rate. This finding is in line with that of Mbutor & Uba (2013) who found that a positive relationship referring to the number of bank branches does not always mean increasing financial inclusion. Opening a new branch office is likely to generate profits but may not be optimal to increase financial inclusion. On the other hand, regarding the economic fundamentals in terms of poverty, it was found that financial inclusion and fintech were able to reduce poverty levels through a significant negative relationship, in line with prior research (Burgess & Pande, 2005; Brune, Gine, Goldberg & Yang, 2011; Kusuma & Indrajaya, 2020; and Williams, Adegoke & Dare, 2017). These results also support Dixit & Ghosh (2013) who found that providing financial services is crucial in lifting the poor out of the poverty cycle. It is evident from the results of this study that access to financial assistance through the number of ATMs has a significant negative effect on poverty in the ASEAN-5. As stated in The Economist (2011) more ATMs mean there is an absorption of labor via the increased demand for ATM maintenance officers. Of course, the more workers absorbed the greater the reduction in the level

of poverty (Economist, 2011).

Financial inclusion in terms of use (savings and credit) has a significant negative effect on the poverty level. Financial inclusion creates a culture of preservation, taking loans no longer from moneylenders but financial institutions; for this reason, providing access to financial services is very important and can pull the poor out of the poverty cycle. As stated by the President of the World Bank Group, Jim Yong Kim, access to financial services can help people to get out of poverty (Pasopati, 2015)

The finding of a significant negative relationship between credit and poverty levels is in line with Bakari, et al. (2019), and is supported by the research results of Abimbola, Olokoyo, Babalola & Farouk (2018), and Coulibaly & Yogo (2016). Of course, this further strengthens the argument that proper and targeted credit distribution plays a vital role in reducing poverty in the ASEAN-5. People can use their acquired credit as business capital, increase their standard of living, or expand their job opportunities; this increases economic activity, ultimately increasing economic growth, and reducing poverty levels (Andrian, Sitorus, MK, & Chandra, 2021). Likewise, savings have a significant negative affect on the poverty rate. This result is in line with the concept of financial inclusion, which states that the more people use formal financial services, the more inclusive the financial system will be, increasing the welfare of the people and ultimately reducing the poverty level. The results of this study are in line with research conducted by Abimbola, Olokoyo, Babalola & Farouk (2018) and Bakari et al. (2019), which showed that savings collected by banks harm poverty.

The finding of a significant negative relationship between cellular phone subscriptions and poverty levels also proves that with increasing cellular phone subscriptions, the use of online shopping and electronic money transactions via cellular applications will increase, in turn absorbing unemployed workers. When the unemployment rate falls, it will directly

reduce the poverty rate. However, the bank branch office variable has no significant effect on the poverty level, indicating that all levels of society have not fully utilized financial inclusion. As argued in previous literature (Bakari, et al., 2019), greater efforts should ensure more people, especially rural residents, have access to bank branch offices, encouraging them to use formal financial products and to increase their income through business activities.

Furthermore, this study found a significant positive effect between inflation and poverty levels. That is, if inflation increases, it will increase poverty in the ASEAN-5. The results follow the theory that rising prices for goods and services will reduce the people's purchasing power, especially those with lower middle income, in turn causing an increase in poverty (Andrian, Sitorus, MK, & Chandra, 2021). Inflation will have a more significant impact on the lower-middle-income population in the ASEAN-5 countries when compared to the upper-middle-income population.

The adverse finding of no-significant relationship between GDP and poverty levels is in line with research conducted by Andrian, Sitorus & Chandra (2021) and Zuhdiyaty & Kaluge (2017). The results indicate that the increase in GDP in relation to the consumption sector is more remarkable than in relation to the investment sector. A rise in GDP is only enjoyed by certain groups, while the lower-middle-income group are not greatly affected by the increase.

Overall, this study confirms that financial inclusion and fintech can be a comprehensive strategy for poverty reduction in the ASEAN-5 countries. Of course, there is a need for policy implications for each country in ASEAN-5 to provide the most comprehensive access to the community, especially those at the bottom of the pyramid who have limited access and use of formal financial services. The need for opportunities to access and use formal financial services and digitalization in developing businesses can improve prosperity, encourage increased income, and ultimately reduce poverty.

5. CONCLUSION

In conclusion, financial inclusion and fintech have an essential role in increasing GDP and reducing unemployment in the ASEAN-5 countries. The most significant contributors to the increase in GDP in terms of financial inclusion are credit (use dimension) and the number of ATMs (access dimension) due to the significant relationship between these variables in almost all ASEAN-5 countries. Meanwhile, the most important contributors to reducing unemployment are credit and savings (use dimension). Considering the use and availability of fintech, e-money makes the most considerable contribution in increasing GDP in the five ASEAN countries observed, generating significant positive results. Meanwhile, the largest contributor to reducing unemployment within fintech is the cellular phone subscription variable.

The results of the SUR model conclude that Thailand is the most influential country in influencing the economic fundamental of unemployment rate based on financial inclusion and fintech. All financial inclusion and fintech variables significantly affected the unemployment rate in Thailand, as evidenced by the unemployment rate of Thailand being the lowest compared to the other four ASEAN countries. Thailand has made great strides in expanding access to financial services. The Thailand Economic Monitor (TEM) explains that 82% of Thai adults already have a formal financial institution account with a relatively narrow gender gap. Recognizing the importance of fintech in promoting financial inclusion, the Bank of Thailand has implemented regulatory, policy reforms and created a department to facilitate fintech growth, while in 2017 Thailand launched a national e-payment initiative, PromptPay (Group, 2019).

In addition, Thailand has successfully developed financial inclusion programs, and government agencies play a significant role in reaching low-income and rural households. The village fund, and the Bank for Agriculture and Agricultural Cooperatives are

critical as together they form one of the largest microfinance institutions in the world. The institution provides credit to farm households and small rural enterprises (Terada & Vandenberg, 2014). In the end, this helps to increase the number of workers and reduce unemployment in Thailand. Of course, this program can be used as a model for Indonesia, the Philippines, Vietnam, and Malaysia to develop microfinance programs.

Next, the results of the SUR model conclude that Indonesia is the country that most effectively influences the economic fundamental of GDP based on financial inclusion and fintech. All financial inclusion and fintech variables significantly affect GDP in Indonesia, as evidenced by the GDP figure in Indonesia, which is the highest compared to the other four ASEAN countries. Indonesia has carried out various efforts and programs to accelerate financial and fintech inclusion. Indonesia's Financial Services Authority, Otoritas Jasa Keuangan (OJK), other Ministries and Institutions, and the Financial Services Institutions (LJK) initiated a Financial Inclusion Month to occur yearly from October 2016. These activities started from financial education, socialization of financial literacy and inclusion, account opening, and lending and micro-financing. In addition, OJK also launched the One Account One Student (KEJAR) program to encourage financial inclusion from an early age among students (OJK, 2020).

However, financial inclusion and fintech do not substantially affect inflation rates in the ASEAN-5, but financial inclusion and fintech can be a comprehensive strategy for poverty reduction in the ASEAN-5 countries. Of course, there is a need for policy implications for each country in the ASEAN-5 to provide the most comprehensive access to the community, especially those at the bottom of the pyramid who have limited access and use of formal financial services. The need for opportunities to access and use formal financial services and digitalization in developing businesses can make people more prosperous, encourage increased income, and ultimately reduce poverty.

6. RECOMMENDATION

This study provides policy implications for governments in Indonesia, the Philippines, Vietnam, Malaysia, and Thailand, to further optimize financial inclusion in urban and rural areas. When people in urban areas have been able to access or use formal financial services, they still tend not to do so in rural areas. For this reason, the government and related institutions are more aggressive in socializing financial literacy because financial literacy is the first step for the community to recognize the benefits of financial inclusion and fintech.

In addition, the right strategy, infrastructure, and regulations, can encourage innovation and increase public confidence in the non-cash system. According to the research of Boston Consulting Group (BCG), more cash-intensive economies tend to grow more slowly and lose significant financial gains. On the other hand, an economy becoming digital is more successful, increasing GDP by 3 percent (bcg.com, 2019). BCG also explains that the advantages come not from more money but from the role of digital technology in simplifying the payment processes and increasing online trading.

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