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Innovation, Economic Growth, Internet Use and Domestic Credit in Asia and Oceania

Viktor Adrian

*Fakultas Bisnis dan Ekonomika, Universitas Surabaya, Surabaya, Indonesia
volcgle@gmail.com*

Deddy Marciano

*Fakultas Bisnis dan Ekonomika, Universitas Surabaya, Surabaya, Indonesia
marciano@staff.ubaya.ac.id*

Abstract

Financial Development (FD) is part of a private sector development strategy to stimulate economic growth and reduce poverty, as well as address the "costs" incurred in the financial system. As one indicator, domestic credit to the private sector refers to financial resources provided to the private sector by financial companies, such as through loans, purchases of nonquity securities, and other trade and receivables loans, which establish claims for repayment. Innovation, economic growth and internet use are three things that are closely related to FD. Therefore, the main purpose of this study is to identify the influence of innovation, economic growth and internet use on the domestic credit of three groups of countries, including developing countries and developed countries in Asia and Oceania, as well as ASEAN member groups. Panel data was used in this study and some linear regression analysis was used as an analytical model. The results showed that on domestic credit, FDI as one of the indicators of innovation only has a positive influence on the ASEAN group of member states, economic growth has a different influence on each group of countries, and the use of the internet has a positive influence on the group of developing countries and ASEAN member countries.

Keywords: domestic credit, economic growth, financial development, innovation, internet use

Introduction

Technological developments nowadays have had a significant impact on almost all aspects of life, especially in the financial sector. When we used to make various transactions using

cash, then now cashless payment methods are rampant, starting from debit and /or credit cards until now the popular digital wallets (e-wallets) such as GoPay, OVO and many more, where all of them can't be separated from the contribution of internet use in it. However, this is only one example of the development in the financial sector itself. The topic taken for this study is about the linkage of domestic credit as one of the indicators of financial development (FD), with innovation and economic growth in various countries.

This study takes several references as follows. Zhu, Asimakopoulou, and Kim (2020) conducted research on FD's relationship to innovation-led growth, with a sample of 50 countries in the period 1990-2016. Owusu-Agyei et al. (2020) conducted research on how internet use affects the overall development of the financial sector, with a sample of 42 countries belonging to the Sub-Saharan Africa (SSA) group of countries in the period 2000-2016. Chien et al. (2020) conducted research on the linear and non-linear effects of the dissemination of information and communication technology (ICT) on FD, with samples of 81 countries during the period 1990-2015.

In the study, Zhu et al. (2020) and Owusu-Agyei et al. (2020) both showed that FDI exerted a negative influence on domestic credit, but with different significance. On the other hand, Zhu et al. (2020) and Chien et al. (2020) research both show that GDP per capita has a positive influence on domestic credit, but only Chien et al. (2020) research shows any significance. For the influence of trade on domestic credit, Zhu et al. (2020) showed positive results, while Chien et al. (2020) showed negative results, although equally significant. On the other hand, for the effect of inflation on domestic credit, Zhu et al. (2020) showed negative but insignificant results, while Chien et al. (2020) showed significant positive results. For the influence of internet use on domestic credit, Owusu-Agyei et al. (2020) and Chien et al. (2020) both showed significant positive results. The differences in reference theory used by each researcher in the study are the cause of some of these differences.

Through the background that has been described, the researchers tried to identify the influence of innovation, economic

growth and internet use on domestic credit from three groups of countries, including the group of developing countries and the group of developed countries in the Asia and Oceania region, as well as the asean group of member countries. This research will be focused on countries in Asia and Oceania, including Indonesia. The reason is because there has not been much research that leads to countries in the Asian and Oceania region as research objects. On the other hand, the development of technology, especially the internet, became the most highlighted thing in the era of globalization.

Review of Literature

Theoretical Review

Eryilmaz, et al. (2015) defines financial development (FD) as part of a private sector development strategy to stimulate economic growth and reduce poverty, addressing the "costs" incurred in the financial system. Whereas according to Cetin, et al., FD means some improvement in generating information about possible investments and allocating capital, monitoring companies and implementing corporate governance, trading, diversification, and risk management, mobilization and unification of savings, facilitating the exchange of goods and services. In addition, Eryigit and Dulgeroglu (2015) define FD as a development of size, efficiency and stability as well as access to the financial system. According to Eryigit and Eryigit (2015), FD refers to optimal fulfillment of financial system functions by eliminating market distortions. Altay and Topcu (2017) mentioned that FD involves the establishment and expansion of institutions, instruments and markets that support investment and growth processes. One of the important indicators of FD is domestic credit, where it will be studied in this study.

Adapted from the Mundi Index (2019), domestic credit to the private sector refers to financial resources provided to the private sector by financial companies, such as through loans, purchases of nonquity securities, and other trade and receivables loans, which

establish claims for repayment. According to Hammill (2020), the term "domestic credit" refers to loans or loans provided by the central bank of a country or region to borrowers in the same region, which may include commercial banks and even involve the government itself.

Riadi (2020) defines innovation as a new change in the form of ideas, ideas, practices or objects of a specific nature, deliberate through a program that is planned and designed to achieve a specific goal. The term innovation in the organization was first introduced by Schumpeter in 1934. The word innovation comes from the English language, namely to innovate which means to make a change or introduce something new. According to Law No.18 of 2002 on The National System of Research, Development, and Application of Science and Technology, innovation is a research, development or engineering activity aimed at developing the practical application of new science values and contexts, or new ways to apply existing science and technology into products or production processes. Important indicators of innovation include FDI (foreign direct investment) and GDP (gross domestic product) per capita. According to Chen (2020), FDI (foreign direct investment) is an investment made by a company or individual in a country into business interests located in another country. Generally, FDI occurs when investors establish foreign business operations or acquire foreign business assets in foreign companies. However, FDI is distinguished from portfolio investments where investors only buy the equity of foreign companies. The definition of GDP (gross domestic product) per capita according to Chen (2020) is a global measure for measuring a country's prosperity and is used by economists, along with GDP, to analyze a country's prosperity based on its economic growth.

Amadeo (2020) defines economic growth as an increase in the production of goods and services over a period of time. Economic growth creates more profits for businesses. As a result, the share price rose. That gives companies the capital to invest and hire more employees. The more jobs created, the more revenues increased. Consumers have more money to buy additional products and services. Buying drives higher economic growth. To that end, all

countries want positive economic growth. This makes economic growth the most reviewed economic indicator. Important indicators of economic growth include government, trade, investment and inflation. According to Brogan (2020), government is a political system in which a country or society is managed and regulated. Trade is defined by Hayes (2020) as a basic economic concept involving the purchase and sale of goods and services, with compensation paid by the buyer to the seller, or the exchange of goods or services between parties. Trade can occur in the economy between producers and consumers. International trade allows countries to expand the market for goods and services that may not be available to them. That's the reason why American consumers can choose between Japanese, German, or American cars. As a result of international trade, the market contains greater competition and therefore, more competitive prices, which bring home cheaper products for consumers. Investments according to Chen (2020) are assets or goods obtained for the purpose of generating income or appreciation. Appreciation refers to an increase in the value of an asset over time. When a person buys an item as an investment, the goal is not to consume the item but to use it in the future to create wealth. Investments are always related to the production of some current assets – time, money, or effort – in the hope of greater returns in the future than originally invested. Bryan (1997) mentions that the term "inflation" originally referred to a general price increase caused by an imbalance between the amount of money and the need for trade. According to Fernando (2020), inflation is a decrease in the purchasing power of certain currencies over time. Quantitative estimates of the rate at which the decline in purchasing power occurs can be reflected in the increase in the average price level of a basket of certain goods and services in an economy over a period of time. The increase in the general price rate, which is often expressed in percentages means that one unit of currency effectively buys less than it did in the previous period.

Adapted from Index Mundi (2019), internet users are individuals who have used the internet (from any location) in the last 3 months. The Internet can be used through computers, mobile phones, personal digital assistants, game machines, digital TVs, etc.

Analysis Model

The analysis model used in this study is a multiple regression analysis model:

$$\begin{aligned} \text{Domestic credit} = & \alpha_0 + \alpha_1^*(\text{Previous year domestic credit}) \\ & + \alpha_2^*(\text{FDI}) + \alpha_3^*(\text{GDP per capita}) \\ & + \alpha_4^*(\text{government}) + \alpha_5^*(\text{trade}) \\ & + \alpha_6^*(\text{investment}) + \alpha_7^*(\text{inflation}) \\ & + \alpha_8^*(\text{internet use}) + \varepsilon \dots \dots \dots (1) \end{aligned}$$

Explanation:

- Domestic credit = financial resources provided to the private sector ((% of GDP)).
- FDI = Foreign direct investment, net inflow (% of GDP)
- GDP/capita = GDP per capita (PPP 2011), natural log of GDP per capita
- Government = General government final consumption expenditure (% of GDP)
- Trade = the number of exports and imports of goods and services measured as gross domestic product (% of GDP).
- Investment = Gross capital formation (% of GDP)
- Inflation = annual percentage change in consumer price index reflection (%)

- Internet use = percentage of internet user population (%)

(Source:
WDI, World Bank)

Hypothesis

Based on the results of theoretical descriptions and previous research, hypotheses in this study include:

- H₁: FDI has negative effect on domestic credit
- H₂: GDP per capita has positive effect on domestic credit
- H₃: government has negative effect on domestic credit
- H₄: trade has positive effect on domestic credit
- H₅: investment has positive effect on domestic credit
- H₆: inflation has negative effect on domestic credit.
- H₇: Internet use has positive effect on domestic credit.

Research Method

Dependent Variable

In this study, the dependent variable used is domestic credit which is an indicator of financial development (FD). Referring to the journal Zhu et al. (2020), domestic credit to the private sector refers to financial resources provided to the private sector as measured by a percentage (%) from GDP. The domestic credit measured comes from three groups of countries, namely developed countries, developing countries and ASEAN member countries

Independent Variables

Independent variables used are seven variables, including foreign direct investment (FDI), gross domestic product (GDP) per capita, government, trade, investment, inflation, and internet use. Foreign direct investment (FDI) and gross domestic product (GDP) per capita are indicators of innovation, while government, trade, investment and inflation are indicators of economic growth.

Indicator of Innovation: Foreign Direct Investment (FDI) and Gross Domestic Product (GDP) per Capita

Referring to Zhu et al. (2020), FDI is measured through net inflows by a percentage (%) GDP, while GDP per capita is measured by its natural log.

Indicators of Economic Growth:

Government, Trade, Investment and Inflation

Referring to Zhu et al. (2020), the government contributes in general final consumption expenditure as measured by a percentage

(%) GDP, trade is the number of exports and imports of goods and services measured as part of gross domestic product as measured by a percentage (%) of GDP, investment is the formation of gross capital as measured by the percentage (%) GDP, and inflation is measured by a percentage (%) annual change in the mirroring of the consumer price index.

Internet Use

Referring to Owusu-Agyei et al. (2020) and Chien et al. (2020), internet use is measured by percentage (%) population.

Control Variable

The control variable used is the previous year domestic credit. Referring to Zhu et al. (2020), domestic credit to the private sector refers to financial resources provided to the private sector as measured by a percentage (%) of GDP.

Population and Sample

The populations in this study were all countries in Asia and Oceania, while the samples were countries in the region that had the necessary data completeness with not too many data gaps in the 2000-2019 range. Sampling techniques used are non-probability sampling in the form of quota sampling. The reason for the use of this technique is because there are some countries that have very little data completeness in the 2000-2019 range. The countries sampled are divided into groups of developed countries and groups of developing countries, so that the influence of each indicator on each group of countries can be more easily known. Developed countries consist of Australia, China, Hongkong, Japan, South Korea, Macau and Singapore. The selected developing countries are as many as 25 countries. In addition, the ASEAN group of countries also reviewed from the group of countries as a whole, as an additional review.

Data Collection Procedure

The data collection procedure for this study uses five steps:

1. Determine the required data according to the measurement needs of dependent variables, independent variables and control variables in this study.
2. Looking for secondary data from official publication data, which in this study is based on the World Bank Open Data (<https://data.worldbank.org/>).
3. Processing requires raw data according to analysis needs.
4. Tabulate the data according to the format of the data analysis tool in Microsoft Excel 2019.
5. Process data with EViews (Econometric Views) 9 for statistical analysis.

Data Processing Method

The main purpose of this study was to understand the impact of independent variables and control over dependent variables using multiple regression analysis. The dependent variable in this study was domestic credit. Independent variables include foreign direct investment (FDI), gross domestic product (GDP) per capita, government, trade, investment, inflation, and internet use, and the control variable was domestic credit the previous year. In this study, descriptive analysis was conducted to determine the value of all variables without comparing or connecting one variable with another. In addition, to determine the best processing method (common effect, fixed effect, or random effect model), Chow and Hausman tests are conducted. After that, classic assumptions are tested to identify the deviant symptoms of classic assumptions in regression analysis.

In addition, several multiple linear regression analyses were performed. The degree of significance selected in this study was 0.05 (5%). This means that the result of the conclusion has a 95% probability or a 5% fault tolerance. To test whether hypotheses are accepted or rejected, F-tests and t-tests are performed. Test F is used to test the relationship of independent variables and controls to dependent variables simultaneously. While t test is a statistical test used to test the relationship between independent variables and controls to dependent variables partially.

Results

Variable Statistical Descriptions

Descriptive analysis shows descriptive variables related to the variables used, including foreign direct investment (FDI), gross domestic product (GDP) per capita, government, trade, investment, inflation, and internet usage. Tables 1, 2 and 3 show descriptive analyzes of variables in each group of countries.

Developed Countries Group

Table 1
Variable Statistical Description of Developed Countries Group

Variables	Domestic Credit				
	Mean	Median	Maximum	Minimum	Std. Dev.
Domestic Credit (t-1)	126.4056	124.237	233.211	40.94229	41.01968
FDI	9.182607	3.658964	58.51875	-3.61882	11.80768
GDP/Capita	46497.46	39434.31	154095.7	2920.515	31269.81
Government	13.66898	14.28875	20.25244	6.498731	3.895434
Trade	4.559556	4.342699	6.092712	2.985587	0.959744
Investment	27.43917	26.14349	46.66012	9.307723	7.952846
Inflation	1.920566	1.93305	8.609519	-3.6855	2.116095
Internet Use	63.36633	69.2	96.15758	1.775913	23.4863
Observed Nations	140				

Source: processed data

In the developed countries group, it is shown that from the innovation indicator, FDI is 9.18% of GDP, while GDP per capita is 46497.46. For economic growth indicators, government final consumption expenditure in general is 13.67% of GDP, trade is 4.56% of GDP, investment is 27.44% of GDP and inflation is 1.92% annual change. The use of the internet is 63.37% of the user population. The number of countries observed was 7 countries, each within a span of 20 years, so that a total of 140 data were obtained. The processing method used is fixed effect because the probability result of the Chow test <0.05 is 0.0003, while the Hausman test is not

carried out because the number of cross-sections is less than the number of coefficients.

Developing Countries Group

Table 2
Variable Statistical Description of Developing Countries

Variables	Domestic Credit				
	Mean	Median	Maximum	Minimum	Std. Dev.
Domestic Credit (t-1)	45.26847	37.10878	149.3734	1.266927	32.07613
FDI	3.057351	1.838468	43.91211	-37.15476	4.591117
GDP/Capita	19467.23	7177.005	141635	920.6647	28354.1
Government	16.51234	13.07886	147.7334	3.460336	16.58971
Trade	88.06631	87.44646	220.4068	0.167418	42.20956
Investment	28.31187	26.84417	69.52741	9.341719	10.25351
Inflation	5.753638	3.968007	57.07451	-18.10863	6.951098
Internet Use	24.40711	14.33	99.7015	0.000289	26.43144
Observed Nations	500				

Source: processed data

In the developing country group, it is shown that from the innovation indicator, FDI was 3.06% of GDP, while GDP per capita was 19467.23. For economic growth indicators, the government's final consumption expenditure in general is 16.51% of GDP, trade is 88.07% of GDP, investment is 28.31% of GDP and inflation is 5.75% annual change. The use of the internet is 24.41% of the user population. The processing method used is the fixed effect because the probability result of the Chow test <0.05 is 0.0003, and the result of the probability of the Hausman test <0.05 is 0.0016.

ASEAN Member Countries Group

Table 3
Variable Statistical Description of ASEAN Member Countries

Variables	Domestic Credit				
	Mean	Median	Maximum	Minimum	Std. Dev.

Domestic Credit (t-1)	49.31684	32.57817	149.3734	1.361492	43.26336
FDI	3.612101	3.023253	14.14573	-2.75744	2.964932
GDP/Capita	13741.82	5357.082	88247.73	920.6647	21028.16
Government	19.32042	11.39849	147.7334	3.460336	25.19762
Trade	100.8932	102.7963	220.4068	0.167418	48.57118
Investment	26.0577	25.46011	69.51028	10.4374	8.219122
Inflation	5.10257	3.421535	57.07451	-2.31497	6.811855
Internet Use	23.80311	17.15036	95	0.000289	24.3151
Observed Nations	200				

Source: processed data

In the group of ASEAN member countries, it is shown that from the innovation indicator, FDI is 3.61% of GDP, while GDP per capita is 13741.82. For economic growth indicators, government final consumption expenditure in general is 19.32% of GDP, trade is 100.89% of GDP, investment is 26.05% of GDP and inflation is 5.10% annual change. The internet usage is 23.80% of the user population. The processing method used is random effect because the probability result of the Chow test <0.05 is 0.0007, while the probability result of the Hausman test >0.05 is 0.5177.

Model Analysis and Hypothesis Testing

The results of model analysis and hypothesis testing are briefly presented in table 4, 5 and 6 below.

Developed Countries Group

Table 4
Regression Test Result of Developed Countries Group

Variables	Hypothesis	t	sig	Remarks
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Domestic Credit (t-1)		23.525	0.000	Accepted
FDI	H ₁	-1.325	0.188	Rejected
GDP/Capita	H ₂	1.616	0.109	Rejected
Government	H ₃	1.904	0.034	Rejected
Trade	H ₄	-2.487	0.014	Rejected
Investment	H ₅	2.099	0.038	Accepted
Inflation	H ₆	0.877	0.006	Rejected
Internet Use	H ₇	1.962	0.052	Rejected

Source: processed data

In the developed countries group, Table 4 shows that the previous year's domestic credit as a control variable had a significant positive effect on domestic credit. Regarding FDI and GDP per capita as indicators of innovation, both H₁ and H₂ are rejected with a significance > 0.05 so that they do not have an effect on domestic credit. For indicators of economic growth, government, investment and inflation have a positive effect on domestic credit, while only trade has a negative effect on domestic credit. As for the use of the internet that does not affect domestic credit. Thus, only H₅ is accepted from the existing hypotheses.

Developing Countries Group

Table 5
Regression Test Result of Developing Countries Group

Variables	Hypothesis	t	sig	Remarks
Domestic Credit (t-1)		54,377	0,000	Accepted
FDI	H ₁	1,499	0,056	Rejected
GDP/Capita	H ₂	-0,636	0,525	Rejected
Government	H ₃	0,009	0,031	Rejected

Trade	H ₄	0,126	0,009	Accepted
Investment	H ₅	3,900	0,000	Accepted
Inflation	H ₆	-2,951	0,003	Accepted
Internet Use	H ₇	4,031	0,000	Accepted

Source: processed data

In the developing country group, Table 5 shows that the previous year's domestic credit as a control variable had a significant positive effect on domestic credit. Regarding FDI and GDP per capita as indicators of innovation, both H₁ and H₂ are rejected with a significance > 0.05, so they do not have an effect on domestic credit. For economic growth indicators, H₃ is rejected with a significance > 0.05 so that the government does not have an influence on domestic credit, while H₄, H₅ and H₆ are accepted, where trade and investment have a significant positive effect and inflation has a significant negative effect on domestic credit. The use of the internet here has a significant positive effect on domestic credit, or thus, the accepted hypotheses are H₄, H₅, H₆ and H₇.

ASEAN Member Countries Group

Table 6
Regression Test Result of ASEAN Member Countries Group

Variables	Hypothesis	t	sig	Remarks
Domestic Credit (t-1)		46.242	0.000	Accepted
FDI	H ₁	2.781	0.006	Rejected
GDP/Capita	H ₂	-0.994	0.322	Rejected
Government	H ₃	-0.149	0.027	Accepted

Trade	H ₄	-0.672	0.015	Rejected
Investment	H ₅	-0.589	0.049	Rejected
Inflation	H ₆	-2.426	0.016	Accepted
Internet Use	H ₇	1.475	0.024	Rejected

Source: processed data

In the group of ASEAN member countries, Table 6 shows that the previous year's domestic credit as a control variable had a significant positive effect on domestic credit. Regarding FDI and GDP per capita as indicators of innovation, H1 and H2 are both rejected but for different reasons. H1 is rejected because it has a positive effect on domestic credit, so it is different from the hypothesis. Meanwhile, H2 is rejected with a significance > 0.05 so that it does not have an effect on domestic credit. For economic growth indicators, all indicators namely government, trade, investment and inflation have a negative impact on domestic credit. The use of the internet has had a positive effect on domestic credit. Thus, the accepted hypotheses are H₃, H₆ and H₇.

Discussion

Innovation and Domestic Credit

Based on the analysis that has been done, it is shown that both FDI and GDP per capita of developed countries and groups of developing countries and do not affect domestic credit. Only FDI from ASEAN member group of countries has a positive influence on domestic credit. These results differ from Zhu et al. (2020) and Owusu-Agyei et al. (2020) studies that both negatively affect domestic credit. This is due to the difference in the number of data along with the period range taken as a research sample, where Zhu et al. (2020) took data from 50 countries in the period 1990-2016, while Owusu-Agyei et al. (2020) took data from 42 countries belonging to the Group of Sub-Saharan Africa (SSA) countries in the period 2000-2016.

Economic Growth and Domestic Credit

Based on the analysis, it is shown that there are differences from the three groups of countries, namely developed countries, developing countries and ASEAN member countries, from economic growth indicators that affect domestic credit, where governments and investments have a positive influence on domestic credit in developed and developing countries, while inflation negatively affects domestic credit in developing countries and ASEAN member countries. Trade has a negative influence on domestic credit in developed countries and ASEAN member countries, but groups of developing countries are the opposite. There are some differences with Zhu et al's research. (2020) and Chien et al. (2020), due to differences in the number of data and period ranges taken as research samples, where Zhu et al. (2020) took data from 50 countries in the period 1990-2016, while Chien et al. (2020) took data from 81 countries in the period 1990-2015.

Internet Use and Domestic Credit

Based on the analysis that has been done, it is shown that of the three groups of countries, namely developed countries, developing countries and ASEAN member countries, only groups of developed countries whose internet use does not affect domestic credit, while in other groups of countries, the influence is positive. These results are different from the studies of Zhu et al. (2020) and Chien et al. (2020). This is due to the difference in the amount of data along with the period range taken as a research sample, where Zhu et al. (2020) took data from 50 countries in the period 1990-2016, while Chien et al. (2020) took data from 81 countries in the period 1990-2015.

Conclusion

Based on the results of data analysis which refers to the research objectives, hypotheses, and analysis models, the following conclusions can be drawn:

1. In the developed countries group, innovation has no effect on domestic credit, economic growth indicators namely

government, investment and inflation have a positive effect while trade has a negative effect, and internet use has no effect.

2. In the developing countries group, innovation has no effect on domestic credit, economic growth indicators, namely government, trade and investment, have a positive effect, while inflation has a negative effect, and the use of the internet has a positive effect.
3. In the group of ASEAN member countries, on domestic credit, FDI as an indicator of innovation has a positive effect, economic growth has a negative effect, and the use of the internet has a positive effect.

Based on the results of the research and the conclusions drawn, the suggestions that can be put forward are:

1. Each country from the group of developed countries and the group of developing countries must be wiser in investing, as shown by the positive effect of investment on domestic credit.
2. Each country from the group of developing countries, including ASEAN member countries which are also included in it, must and be aware of the effects of inflation, as shown by the negative effect of inflation on domestic credit.
3. Each country from the group of developing countries must be able to optimize the use of the internet efficiently and effectively in order to advance their respective countries, as shown by the positive effect of internet use on domestic credit.
4. For further research, it is suggested to add other variables that can have a positive effect on domestic credit.

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