

The Effect of E-Commerce on National Income in 114 Countries

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ABSTRACT

Information, Communication and Technology (ICT) was growing rapidly. E-commerce creates new economic activities through technology, especially in the field of trade. The main objective of the studied was to analyze the effect of e-commerce on national income. The analysis was performed by EC2SLS (Error Component-Two Stage Least Square) method. Analysis using panel data with cross section data of 114 countries in the 2016-2017 period. The data used were GDP data based on purchasing power parity (PPP); previous year's GDP; e-commerce users; ICT services exports and imports; government spending; investment (FDI); country dummy. The analysis shows that e-commerce had a significant effect on national income. E-commerce for 113 other countries had a positive influence of 0.0026% while e-commerce for indonesia had a positive influence of 0.0080%.

Keywords : ICT, E-Commerce, National Income

I. INTRODUCTION

The world continued to evolve. Information and Communication, Technology (ICT) and innovation became interesting issues and became a concern for experts. Innovation and ICT brought people to a new era, especially in the economy. The discovery of the internet in 1969 was the beginning and at the same time as a trigger that brought this world into the era of globalization and the loss of boundaries between countries in this world. The internet had an important role in the rapid development of the world economy today, it was undeniable that an increasingly competitive business environment requires the internet in trading, shopping, marketing, advertising, and retail sales.

Large, small and modern businesses had used the internet to supported their business. The internet had brought changes to many industries, ranging from

providing logistics services, marketing products, delivering information and even conducting transactions. The number of internet users that continues to increase which was also accompanied by an increase in the human population into a huge market potential.

TABLE I. INTERNET USAGE AND WORLD POPULATION IN 2018

Regional	Penetration (% Pop.)	Growth 2000-2018	Internet usage (% World)
Africa	36,10%	10.199%	11,00%
Asia	49,00%	1.704%	49,00%
Europe	85,20%	570%	16,80%
Latin America	67,20%	2.325%	10,40%
Middle East	64,50%	4.894%	3,90%
North America	95,00%	219%	8,20%
Oceania / Australia	68,90%	273%	0,70%
WORLD	55,10%	1.066%	100,00%

Source: Internet world stats 2019

Table 1 showed the level of internet usage in 2018. In 2018 the total world population reached 7.63 billion people with half more or 55.10% of the world population living in the asian region, so it was not wrong if the world internet users were 49% went from Asia, even though Africa showed amazing growth of internet users in the period 2000 to 2018 with an internet growth rate of 10,199%, followed by the Middle East with a growth rate of 4,894%, Latin America grew 2,325% and Asia grew by 1,704%. North America has not had internet users as many as in Asia but had the highest internet user penetration rate of 95% followed by Europe at 85.2%.

In 2018 the world internet users penetration rate reached 55.1% meaning that more than half of the world's population had used the internet, within 18 years, from 2000 to 2018 internet users in the world had grown by 1,066%. Innovation and ICT continued to grow and provide new opportunities and activities for the economy. The development of ICTs creates social networks that were the future of e-commerce (Kurnoga and Slišković 2017). According to Kurnoga and Slišković (2017) the reasoned was that humans were social creatures and were interested in social communication, the main features of all social networks were universal communication tools and techniques, and there were common goals that unite groups of people.

Kurnoga and Slišković (2017) also added that e-commerce provides many advantages, in addition to the global market offered by e-commerce, another advantage was the manifestation of time could be done 24 hours a day, 7 days a week, and 365 days a year, besides the availability of product price comparisons, the reviews and experiences available from other users, searching for products and services could also be done only from home so that saving time was the advantage of e-commerce, not only about products or services, but also about companies concerned.

Electronic commerce or e-commerce emerged over time and rapid market shared growth. As a manufacturer of course e-commerce helps in increasing broader market reached and for consumers e-commerce will help in fulfilling their utility. The internet had became an important business platform for trading, distributing and selling products between organizations, between organizations and consumers, and even between consumers (Corbitt et al, 2003).

According to Anuj et al (2018) in general e-commerce was defined as the buying and selling of goods and services, or the transmission of funds or data through electronic networks, especially the internet. Laudon and traver (2014) also revealed that e-commerce was defined as the used of the internet, the web, and applications to transact or digitally allowed commercial transactions between organizations and individuals.

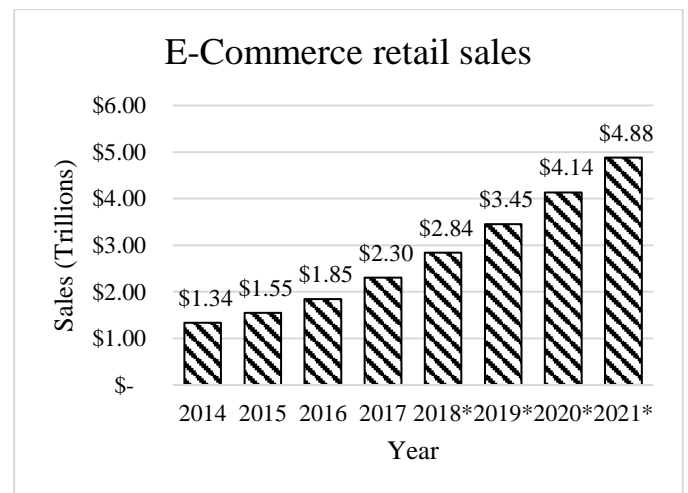


Figure 1 : E-commerce retail sales worldwide 2014-2021

Figure 1 showed the prediction and development of e-commerce through the level of e-commerce retail sales worldwide in 2014 - 2021. The level of e-commerce sales in 2014 showed a figure of 1.34 trillion US \$ and continued to increase until 2017 with the amount of 2.30 trillion US \$ and was predicted to continued to increase in 2021 with a value of 4.88 trillion US \$. The growing population and internet users and supported by the rise of

supporting hardware such as computers and cell phones had caused rapid penetration of cellular connections and active users of social media which makes e-commerce increasingly popular and growing rapidly among economic actors.

E-commerce could intensify competition and produced benefits for consumers at lowered prices and more choices (Malkawi, 2007). The internet and e-commerce lead to increased efficiency, better asset utilization, faster time to market, reduced total ordered fulfillment time, and improved user services (Terzi, 2011).

The existence of e-commerce will stimulate increased consumption and production in the community which will ultimately increased national income. The internet could expand opportunities for cross-border business-to-business (B2B) and business-to-consumer (B2C) transactions, in particular internet business-to-consumer (B2C) transactions had the potential to revolutionize global trade, namely trade individualization (Anvaria and Norouzi, 2016). That was what makes e-commerce able to increase the national income of a country by increasing competitive competition, efficiency, capturing a wide market and allowing individualization of trade.

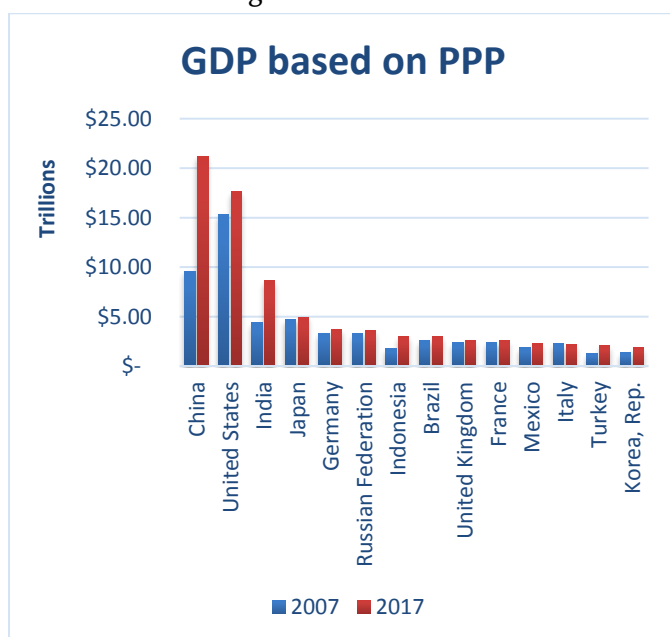


Figure 1 : GDP based on PPP (constant \$ international 2011) in 2007 and 2017

Figure 2 shows the changed in GDP of the 15 highest countries based on purchasing power parity (PPP) in 2007 and 2017. In 2007 United States still dominated the world economy with GDP of 15.36 trillion US \$ then 10 years later namely in 2017 China became the country had the largest GDP of 21.22 trillion US \$ and United States was in second placed with a GDP of 17.66 trillion US \$ while Indonesia was in seventh position with a GDP of 2.95 trillion US \$. Overall, all selected countries experienced an increase in GDP in 2017 compared to 2007.

A country's wealth and economic wealth were primarily driven by the income it generates, therefore determining the main driving of income was an important question for researchers and policy makers. One of the fundamental sources of income was innovation (Cardona et al, 2013). In 2017, the internet and e-commerce had grown more rapidly and the available market was also getting bigger so that it could boost national income. The main types of technological changed were those that were simply able to provide a multiplier effect on the production function through increasing economies of scale (Solow, 1956).

Based on Qu and Chen's research (2014), e-commerce development had been proven to had an influence on economic growth, especially due to the number of internet users, the number of e-commerce companies and the increasing number of online shopping users. E-commerce also influenced the unemployment rate. Anvaria and Norouzi (2016) argued that e-commerce will lead to individualization of trade, meaning that everyone was able to trade independently and contribute individually to the economy.

Based on zthe Solow Growth Model, in the long run economic growth must originate from technological progress (Solow, 1956). Then the Solow Growth Model was developed by the Romer model where clearly Romer revealed that technological progress was driven by the discovery of new products, which

in turn was due to researched and development (R&D) (Romer, 1990). Over the past two decades, there had been many studies using R&D as a proxy for knowledge capital to find out the relationship between knowledge capital and income. As icts develop, e-commerce was emerging as an important typed of knowledge capital to operate businesses and help driven the economy.

There were many studies on the impact of ICT on economic growth or GDP as a macroeconomic variable, but studies that discuss e-commerce were still difficult to find and the explanation was still lacking in depth, researched on e-commerce was very important because e-commerce will played an important role in national development process so that the used of strategies and policies on e-commerce must be carried out appropriately, therefore it was necessary to studied in depth e-commerce.

The main objective of this researched was to analyze the effect of e-commerce on the national income seen through GDP based on purchasing power parity (PPP) in 114 countries and in the period 2016-2017.

II. METHODS AND MATERIAL

2.1 Data Source and Text Mining

The data in this studied used secondary data. The data obtained from various sources, such as the World Bank, WITS and Statisa. The data used was in the form of panel data, which was a combination of time series data and crossed section data (Juanda and Junaidi 2012). The time series data used were annual data for the period of 2016 to 2017. The cross-border data used covers 114 countries.

The number of panel data observations for each variable was $114 \times 2 \text{ years} = 228$ observations for analysis. The list of countries used in this studied could be seen in the appendix. The choice of period and individual or country in this studied was based on

the availability of access and e-commerce data, analysis per country could be used to analyze the pattern of e-commerce influence of each country in general by knowing the factors that influence e-commerce and its influence on economic development and unemployment in a country so that policy proposals could be made in the end.

The data used are GDP data based on purchasing power parity (PPP); Previous year's GDP; E-commerce users; ICT services Exports and Imports; Government spending; Investment (FDI); Country Dummy. In summary the variables and data sources are presented in Table 2.

TABLE II
VARIABLES AND DATA SOURCES

No	Variable	Unit	Source
1	GDP	Trillion	World Bank
2	Lag GDP	USD	World Bank
3	E-Commerce users	Trillion USD	World Bank
4	Inflation	Million	Statista
5	Export ICT services	Percent	World Bank
6	Import ICT services	% total export	WITS
7	Government spending	% total import	WITS
8	Investment (FDI)	Percent	World Bank
10	Dummy e-commerce user interaction	% GDP	World Bank

2.2 Simultaneous Panel Method

The component error model was one of the earliest econometric models developed to enable the used of collected time series data and crossed section data (Balestra & Varadharajan, 1987). Studies such as

Balestra & Nerlove (1966), Wallace & Hussain (1969), Amemiya (1971) were some references related to single-equation error component models. The new component error structure was extended to the simultaneous equation system by Baltagi (1981), Balestra & Varadharajan (1987), and Prucha (1985).

Baltagi's 2SLS simultaneous panel model itself was known as the two-stage least squares (EC2SLS) error component, the 2SLS Balestra & Varadharajan simultaneous panel model (1987) was called generalized two-stage least squares (G2SLS), while the simultaneous 2SLS Prucha (1985) panel model known as full information maximum likelihood (NFIML). In this studied the model used will refer more to the 2SLS simultaneous panel model Baltagi (1981) and Balestra and Varadharajan (1987), because the estimation method used was ordinary least squares (OLS) instead of maximum likelihood (ML).

EC2SLS is interpreted as a weighted combination of three 2SLS predictors and is proven to be consistent and asymptotically normal with limited covariance matrices (Baltagi 1981). Estimation of variance components for EC2SLS estimators is based on Two-Stage Least Squares (2SLS), EC2SLS is a consistent estimator of structural parameters, and the asymptotic distribution is proven to be normal (Baltagi 1981). G2SLS and Indirect Least Squares (ILS) estimators of just identified structural equation coefficients have the same distribution restrictions and when the entire system is just identified, G2SLS is asymptotically equivalent to ILS estimators, but in general G2SLS has disadvantages, because variance is unknown (Balestra & Varadharajan, 1987).

The purpose of this studied was to identify the effect of e-commerce on national income, the determination of exogenous and endogenous variables in simultaneous equations was carried out by researchers with priori information (based on theory and empirical researched). Furthermore, the model refers to the national income equation ($Y = C + I + G$

+ N_x) to analyze how e-commerce influences national income through the consumer side. E-commerce will be used as a proxy for consumption. The equation could be formulated as follows:

$$\text{LnGDP}_{it} = \beta + \beta_1 \text{L1_LnGDP}_{it} + \beta_2 \text{LnUserEC}_{it} + \beta_3 \text{Invest}_{it} + \beta_4 \text{Gov}_{it} + \beta_5 \text{Exp}_{it} + \beta_6 \text{Imprt}_{it} + \beta_7 \text{LnUserEC_D1}_{it} + \mu_{it}$$

Where:

- α, β, γ = intercept
- i = 114 countries
- t = 2 years (2016-2017)
- LnGDP_{it} = GDP (Trillion US \$)
- L1_LnGDP_{it} = Lag GDP (Trillion US \$)
- LnUserEC_{it} = E-commerce users (Million)
- LnUserEC_D1_{it} = Interaction between e-commerce user variables and the Indonesian state (e-commerce user sample groups Indonesia / 113 other countries)
- Gov_{it} = Government spending (Percent)
- Exp_{it} = ICT services exports (Thousand US \$)
- Imprt_{it} = ICT services exports (Thousand US \$)
- Invest_{it} = FDI (Percent)
- D1 = Indonesia = 1
Other countries = 0

III. RESULTS AND DISCUSSION

Analysis of the influence of e-commerce on national income aims to analyze the contribution of e-commerce to national income from the pointed of view of consumers. The variable chosen in this equation was based on the equation of national income identity from the ad side of $Y = C + I + G + (N - X)$. E-commerce (LnUserEC) users became a proxy of consumption (C), FDI (Invest) a proxy of investment (I), government spending growth (Gov) being a proxy of government spending (G) as well as export (Exp) and import (Imprt) computer,

communication and other services were proxies of exports (N) and imports (X).

TABLE III. EC2SLS ESTIMATED RESULTS
RANDOM-EFFECTS IV REGRESSION

Variabel (LnGDP)	Model	
	Elasticity	P> z
LnUserEC	0,00262	0,180
LnUserEC_D1	0,00541***	0,000
L1_LnGDP	0,995***	0,000
Invest	0,0249*	0,063
Gov	0,0773***	0,001
Exp	0,0196*	0,053
Imprt	-0,0361***	0,005
Konstanta	0,148***	0,000
<i>R-squared</i>		0,999
Prob (<i>F-statistic</i>)		0,000

Note: *** Significant at 1% level

** Significant at the 5% level

* Significant at the 10% level

Source: Results of processing using STATA 14

The EC2SLS random-effects IV regression estimation results on the national income model showed an R² value of 0.99 which means that 99% of the diversity of endogenous variables National Revenue (LnGDP) could be explained by E-Commerce Users (LnUserEC), Investment (Invest), the previous year's national income (L1_LnGDP), Government Expenditures (Gov), Export and Import of Computer Services, Communications and others (Exp and Imprt) as well as E-Commerce User Dummy (LnUserEC_D1) and the rested were explained by other variables outside model.

The e-commerce users (LnUserEC) variable was interacted using a dummy variable for Indonesia where the value 1 for Indonesia and the value 0 for 113 other countries so that the LnUserEC coefficient was the influence of e-commerce users from countries other than Indonesia and the LnUserEC_D1

coefficient plus the LnUserEC coefficient was the influence of e-commerce users in Indonesia on national income. E-commerce users from other countries had an influence of 0.0026 meaning that when there was an increase in e-commerce users by 1%, national exposure will increase by 0.0026% in 113 countries other than Indonesia. Furthermore, the dummy variable of e-commerce users in Indonesia (LnUserEC_D1) was significant at the real level of 1%, the influence of e-commerce users in Indonesia alone was 0.0080% meaning that if there was an increase in e-commerce users by 1% then economic growth will increase by 0.0080% in Indonesia.

E-commerce users were used as a proxy for consumption to analyze the effect of e-commerce on national income. E-commerce users were the number of customers (or accounts) who actively pay from the chosen market (market segment, region) in millions for each year in a country so that it could describe the level of expenditure/consumption of people through e-commerce. E-Commerce allowed people to get a large selection of products, get goods that were not available near where they lived, save time and access a large market making it easier for people to bought a product. The eased with which e-commerce was provided to the public could increase consumption, which in turn will increase national income.

The previous year's national income (L1_LnGDP) had a significant effect at 1% level. The coefficient value of L1_Grow was 0.99 meaning that if national income in the previous year increased by 1% then economic growth will increase by 0.99%. Significant investment at the real level of 10% and had a positive influence on national income. The value of the investment coefficient of 0. 025 means that when investment rises by 1%, economic growth will increase by 0.025%. Investment was needed to overcome capital problems and help to driven the economy so that it could help increase economic growth. Government expenditure (Gov) was significant at the 1% level that had a positive influence on economic growth. The

Gov coefficient value of 0.077 means that when there was an increase in government spending by 1%, economic growth will increase by 0.077%.

The export (exp) and import (imprt) variables were exports and imports of computer, communication and other services that could describe ict in and out of a country. The relationship of exports (exp) and imports (imprt) on the economic growth equation from the demanded side was in accordance with the identity equation where exports (exp) of computer, communication and other services had a positive effect in increasing economic growth while imports (Imprt) of computer, communication and other services had a negative relationship with economic growth.

The Export Variable (Exp) was significant at 1% significance level with a coefficient value of 0.019 meaning that when ICT service exports rise by 1% the economic growth will increase by 0.019%. Exports could increase state income so that it had a positive effect on economic growth. Imports (LnImprt) were also significant at the 1% level that had a negative relationship with a coefficient value of 0.036 meaning that when imports of ICT services go up 1% then economic growth will decrease by 0.036%.

The main objective of this equation is to analyze the effect of e-commerce on national income. The estimation results of e-commerce on national income where the influence is not too large but technology and e-commerce that continue to grow and develop rapidly have the potential will have a big influence on future economic growth.

IV.CONCLUSION

E-commerce was proven to had a significant effect on increasing national income. E-commerce users from other countries had an influence of 0.0026 meaning that when there was an increase in e-commerce users by 1%, national exposure will increase by 0.0026% in

113 countries other than Indonesia. Furthermore, the dummy variable of e-commerce users in Indonesia (LnUserEC_D1) was significant at the real level of 1%, the influence of e-commerce users in Indonesia alone was 0.0080 meaning that if there was an increase in e-commerce users by 1% then economic growth will increase by 0.0080% in Indonesia. The most influential variable was the previous year's national income with a coefficient of 0.99.

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