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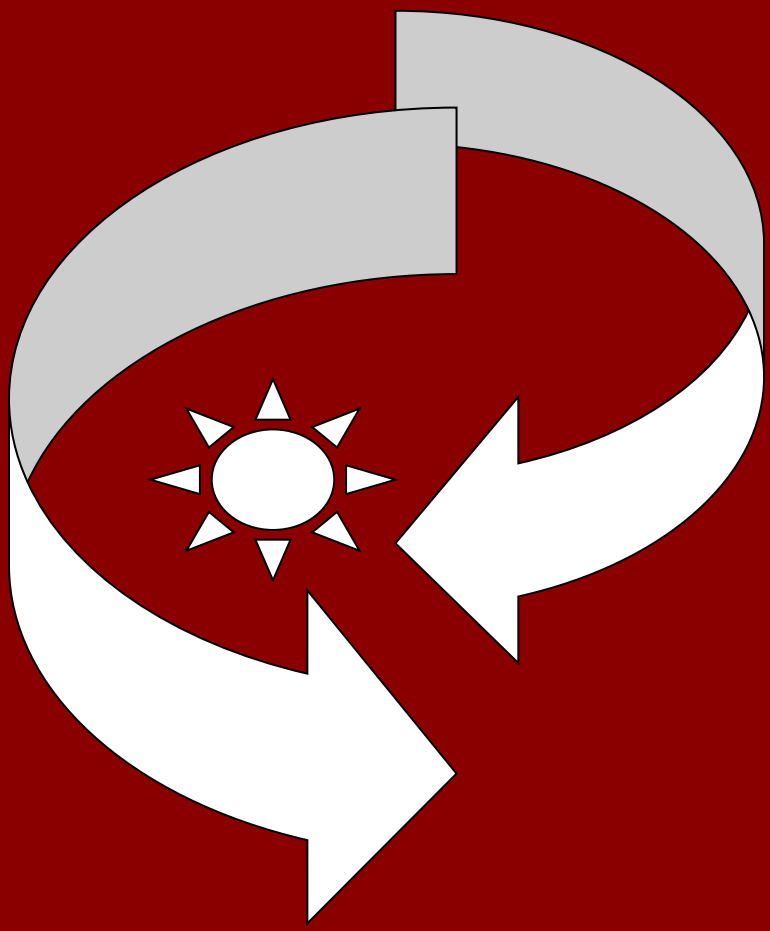

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Jurnal
Perspektif Pembiayaan dan Pembangunan Daerah
(Journal of Perspectives of Financing and Regional Development)

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Editor's Note

Since Volume 6, Issues 2 (September – October 2018), the Journal of Perspectives on Financing and Regional Development has been nationally accredited with SINTA (Science and Technology Index) score of S2, based on the Decree of the Director General of Development and Research Enhancement, Ministry of Research, Technology & Higher Education of the Republic of Indonesia, Number 10/E/KTP/2019 concerning the Ranking of Scientific Journal.

In Volume 8 Issue 3, 2020 is presented eleven articles that come from Salale University (Ethiopia), Adama Science and Technology University (Ethiopia), Jimma University (Ethiopia), University of Jember (Indonesia), Rufus Giwa Polytechnic (Nigeria), Olusegun Agagu University of Science & Technology (Nigeria), Mulawarman University (Indonesia), Sriwijaya University (Indonesia), Universitas Negeri Gorontalo (Indonesia), Universitas Jambi (Indonesia), Federal University Oye-Ekiti (Nigeria), Universitas Muhammadiyah Jambi (Indonesia)

Hopefully in the next issue can be presented articles with issues and from more diverse circles.

Happy joy reading

Editorial

Effect of climate change on agricultural output in Ethiopia

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Abstract

Currently change in climate is known as the main environmental difficult that the world face. Its effect is openly reduces agricultural output in particular and economic growth in general. The main objective of the study was to examine the long run and short run effect of climate change on agricultural output in Ethiopia over a period of 1980-2016. The Auto Regresive Distributive Lag approach to co integration was applied to examine the long run and short run effect of climate change on agricultural output. ADF test was used for Unit root test. Result of bound test reveals that there is stable long run relationship between RAGDP, labour force, Mean annual rainfall, Average temperature, agriculture land, and fertilizer input import. The estimated long run model reveals that climate changes have an important effect on agricultural output which is the main contributor of overall GDP of the country. The coefficient of error correction term is -0.738 suggesting about 73.8% annual adjustment towards long run equilibrium. The estimate coefficients of short run show that mean annual rainfall have significant effect whereas average temperature has insignificant effect on output. In the long run both main variable of interest have significant effect on agricultural output with a positive effect from mean annual rainfall and negative effect from average temperature. In order to lessen the effects the study recommends concerned body needs to create a specific policies especially focus on technological adoption that avert effect of increase in temperature and that would result increase on the output by adopting technology at macro and micro level, additionally information regarding climate should be available for producers and consumer.

Keywords*: Agricultural output, ARDL, Climate, Ethiopia*

JEL Classification: Q1, Q10, R15

INTRODUCTION

Currently change in climate of the world is widely agreed by the scientific community. The Intergovernmental Panel on Climate Change (IPCC) has reached that activities human are changing the climate system and will remain to do so (IPCC, 2014). In the previous century, surface temperatures, associated impacts on physical and biological systems are progressively being observed. These findings tells us that change in climate will result in environmental changes, such as sea level rise, and alterations of climatic zones due to increased temperatures and altering rainfall patterns.

Globally Changes in the concentrations greenhouse gases (GHGs) and aerosols, land cover and solar radiation in atmospheric would alter the system of climate energy balance. GHGs emissions are increased over time due to human activities. Economic and population growth are most drivers of increase in Carbon dioxide (IPCC, 2014). More than 75% of all Co2 emission comes from developed country. Recently there is accelerating emission GHGs in emerging economies like Brazil, China, and India had a serious concern. More over the effect is not equally shared. Least developing countries and people receive the effect of climate change first and will suffer the most as these nations are more susceptible to the negative effects of change in climate which would affect productivity and human health (Akram & Abdul, 2015).

Ethiopia is the least developing country in the world, but recently Ethiopia had an remarkable track of record growth and reduction in poverty in recent years, with GDP growth averaging 10.1 over two decades, about 8 percent GDP per capital growth. Poverty has dropped prominently and inequality, 30 percent Gini index which is low by international and Sub Saharan Africa (SSA) standards (International Monetary Fund, 2016). However, Ethiopia is heavily dependent on rain fed agriculture. The physical location and landscape coupled with little adaptive capacity necessitate a high vulnerability to adverse impacts of change in climate, due to these the country face drought in different periods due to climate changes that directly affecting agricultural output (International Monetary Fund, 2016). This makes the country to face different drought cause problems in different periods that leads chronic food shortage and food insecurity for long periods (Gebreegziabher et al, 2011). For instance in 2015/16 El Nino driven climate change caused one of the worst drought in many region of Ethiopia. This directly affect agricultural sector's performance which would affect other sector in the economy (World Bank, 2010).

The vulnerability of agriculture production to climate change in Ethiopia have a direct effect on rural population whose activity is producing agricultural products for their livelihoods and to generate income and it has indirect effect on other sector like industry sector those who use raw material from agriculture sector and urban population through increasing price of agricultural product. This would affect the economic growth through food security, water and energy supply, poverty reduction and development (National Meteorology Agency, 2007). Climate changes in Ethiopia are occurring that affect directly agricultural output of the country which depends on climate input.

Change in the pattern of rainfall and temperature would affects the economy. Ethiopia recorded the lowest annual rainfall in 30 years in 2015 due to El Niño this would affect the economy where half of GDP comes from agriculture and 99% of electrical energy in a country on which different sector is dependent is generated by hydroelectric power which in turn depends on rainfall capacity (Ali, 2012). A change in climate in Ethiopia may reduce 10% by 2045 country GDP, mostly through influences on agricultural output, these changes also affect economic activity and intensify the prevailing socio-economic problems (United State Agency International Development, 2013).

Besides the importance of agriculture sector, any shock related to agriculture would has wider economic impact on agriculture and other sectors. Previously research is conducted in this area for instance, Tadele et al (2010), Yalew (2016), Deressa (2007) the first two studies analyzed the impact of climate change on agriculture by using computable general equilibrium analysis, whereas Deressa studies effects by using Ricardian approach, Ali (2012) analyzed impact of climate change on economic growth.

Most of those researches are used computable general equilibrium analysis which face a limitation in that it doesn't consider temporal effect of climate change on agriculture, Ricardaian approach is grounded on survey data on climate change so it may face valuation problem by respondents and require awareness and the other examined impact of climate change on economic growth, but climate change directly affect agriculture sector. The aim of the study is to relate climate change to single aggregate agricultural output that time series analysis, to fill the gap, supplement on the prevailing literature, and researching in this area is useful for national policies. So the study focuses on effect of climate change on agricultural output in Ethiopia by using time series data that span from 1980-2016.

LITERATURE REVIEW

Climate change and agriculture

Agriculture can be affected by Climate in a variety of ways. Temperature, radiation, rainfall, soil moisture changes in average temperatures; rainfall and climate extremes with an important impact on soil erosion, changes in pests and diseases, changes in atmospheric carbon dioxide, changes in the nutritional quality of some foods, changes in growing season, and changes in sea level and carbon dioxide (CO2) concentration are all important variables to determine agricultural productivity, and their relationships are not simply linear (Zhai & Zhuang, 2009). Existing studies shows that there are starting point for these climate variables above which crop doesn't grow. For instance, the modeling studies discoursed in recent IPCC reports indicate that an increase in temperature from moderate to medium by 1–3ºC, along with associated CO2 increases and rainfall changes, are likely to benefit crop yields in temperate regions. Whereas, in low-latitude regions, an increase in temperature in moderate temperature by 1–2ºC are expected to have negative yield impacts for major cereals. Warming of over 3ºC would result reduction in crop in all regions (IPCC, 2007).

Contribution of agriculture to the economy of Ethiopia

Agriculture is known to supply the country with food grains, cash crops, and dairy and meat products among other things. Besides, the sector provides relatively abundant food and raw materials to the increasing industry-based urban population. Productivity in the agricultural improves the level of income received by the rural people. Increased income is believed to generate increased demand for the manufactured goods from the industrial sector, in addition to increase income improve the living standard and to take a part in international market. Outside of gold, Ethiopia's top five exports are all agricultural products: coffee, sesame, fruits and vegetables, and leather. Thus, both domestically and internationally, agriculture remains at the heart of Ethiopia's development (Agricultural Transformation Agency, 2016).

In reaching middle income country by 2025 agriculture sector plays a major contribution to the goal this through Shifting smallholder farmers from survival centered production to market oriented production by adopting modern tools and techniques is main agenda for the sector. For long-term success, this shift must be done while simultaneously bolstering resilience toward climate change and ensuring environmental sustainability (ATA, 2016).There is year to year fluctuation in agricultural GDP this variation is due to climate change. So ignoring this sector would have a huge impact on countries economy.

Empirical literature on impact of climate change

Barrios et al. (2007) studies effect of climatic change on the total agricultural output of Sub- developing countries by dividing into sub Saharan and non-sub Saharan

Africa. The study used cross-country panel dataset within the framework of agricultural production. The findings of the study revealed that change in climate, agricultural production in SSA is affected by climate change whereas, agricultural production in Non-Sub Saharan Africa not affected by climate change.

Ogbuabor & Egwuchukwu (2017) conducted on effect of climate change on the economy of Nigeria, by employing OLS method and error correction model. Time series data variable like annual rainfall, carbon emission and forest depletion are used to capture climate change and government expenditure, domestic private investment, exchange rate was used as control variable. They founds that carbon emission affect growth adversely in long run and short run, forest depletion affects negatively in the short run.

Akram (2016) study investigated effects of climate change on the economic growth of Pakistan.by disaggregating the study result show that temperature has a negative and significant relationship with GDP, in addition there is also negative relationship with productivity in the agricultural sector, manufacturing and services sectors. As of compared to manufacturing and services, negative effects is higher for the Agriculture sector.

Alagided et al (2014) examines the effect of change in climate on economic growth for 27 Sub Saharan Africa countries including Ethiopia. They used panel co integration method. Temperature and precipitation are variables to capture climate change. There result show that a increase in temperature diminishes economic performance in SSA and they concluded that given sub-Saharan Africa relies on agriculture sector for the majority of economic output, a higher temperature could actually reduce agricultural output.

Ali (2012), studies on the impact of climate change on rain fed economy. He used annual rainfall, labor force and land under major crops and co-integration method for analysis. He finds rainfalls variation have a negative effect on growth.

As several empirical and theoretical reviews shows climate variable like temperature, rainfall, soil moisture, deforestation and land degradation affect economic growth through effect on agricultural output as the empirical evidence shows, more over rather than affecting economic growth it directly affect agricultural output which in turn affect livelihoods for the majority of people.

MODEL SPECIFICATION AND METHODOLOGY

Data description and source

The Table 1 shows measurement of variable and source of data that was used in the study. Data included in this study based on availability of data and based its impact on dependent variables.

Table 1. Summary of the data source by variable

Type of variable	Unit of variable	Source
Agriculture output	Real Agricultural Gross Domestic Product	MOFeD
Labor force	Total labor force(15-64)ages	CSA
Agricultural land	Percentage of total land	WDI
Temperature	Degree Celsius	CCKP
Rainfall	Millimeter	CCKP
Fertilizer input import	Metric ton	NBE

Source: ***MOFeD*** *= Ministry of Finance and Economic Development;* ***CSA*** *= Central Statistical Agency;* ***WDI*** *= World Development Indicator;* ***CCKP*** *= Climate Change Knowledge Portal;* ***NBE****= National Bank of Ethiopia*

Method of data analysis and estimation techniques

The reason for conducting stationarity test is the use of non-stationary data can lead to spurious regressions. If the variables employed in a regression model are not stationary, then it can be proved that the standard assumptions for asymptotic analysis will not be valid. In other words, the usual t-ratios will not follow a t-distribution, and the F-statistic will not follow an F-distribution, and so on (Brooks, 2008).

To test unit root there are a number of varying approach have been developed. Among the methods of testing the presence of a unit root in a series the common ones include Dickey-Fuller (DF), and Augmented Dickey Fuller (ADF), Based on DF test, the series Y is stationary if the absolute value of 'δ' in the equation is less than unity. However, it is not stationary if the absolute value of 'δ' is greater than or equal to unity.

$Yt = \delta Yt\text{-}1 + Ut$ ..... (1)

$\Delta Yt = \alpha Y\ t\text{-}1 + Ut$ ..... (2)

Where, $\alpha = (1-\delta)$

Hence, the null that δ=1 is equivalent to H0: α=0. However, DF test assumes that the data generating process follows the Auto Regressive of order one which biases the test in the presence of serial correlation. In order to calculate the critical values of the τ (tau) statistic, Dicky-Fuller assumes that the error terms (ut) are not correlated (Enders, 1996). But the error term in the Dickey-Fuller test usually has autocorrelation, which needs to be removed if the result is to be valid. In addition, the critical values of τ (tau) statistics do not follow the normal distribution function and in general, the critical value is considerably larger than its counterpart of t- distribution. Therefore, using such critical values can lead to over-rejection of the null hypotheses when it is true. The ADF unit root test is used to overcome this limitation of DF test. ADF overcome these limitations by adding additional lag of first differenced of dependent variable. Therefore, this study used ADF test for stationary test.

Procedure for ADF test

$$\Delta yt = a + \delta t + \gamma yt - 1 + \sum_{t=1}^{p} \mu \Delta yt - i + \epsilon t \quad \text{..... (3)}$$

Where δ is a time series variables under consideration in this model at time t,

t - time trend variable

Δ - denotes the first difference operator

ϵt - the error term; p is the optimal lag length of each variable chosen such that first- differenced terms make a white noise.

Thus, the ADF test is the null hypothesis of no unit root (stationary).

That is: H0: $\gamma = 0$ H1: $\gamma \neq 0$ If the t value or t-statistic is more negative than the critical values, the null hypothesis (I.e. H0) is rejected and the conclusion is that the series is stationary. Conversely, if the t-statistic is less negative than the critical values, the null hypothesis is accepted and the conclusion is that the series is non-stationary.

The term of co integration was first introduced by Engle & Granger (1987) after the work of Granger and New bold (1974) on spurious regression. In other words, there exists one or more linear combination of those I(1) time series (that is stationary (or I(0)). Those stationary combinations are called co integrating equations. There are three major methods of testing co integration: the Engel-Granger two-step procedure (EG),

the Johansen Maximum Likelihood procedure and ARDL bound test approach to co integration. Engle granger have its short comings these shortcomings are it is difficult to determine the number of equilibrium relationship if the variable are more than two, since it allows for single co integration and Johansen co integration approach method needs a variable to be integrated order of same whether I(0) or I(1) but not mix of the two. But, ARDL overcome this problem.

A large number of past studies have used the Johansen co integration technique to determine the long-term relationships between variables of interest. In fact, this remains the technique of choice for many researchers who argue that this is the most accurate method to apply for I(1) variables. Recently, however, a series of studies by Pesaran et al (1996) have introduced an alternative co integration technique known as the Autoregressive Distributed Lag (ARDL) bound test. This technique has a number of advantages over Johansen co integration techniques. First, the ARDL model is the more statistically significant approach to determine the co integration relation in small samples. It can also leads us to know error correction model which can be derived from ARDL model through a simple linear transformation, which integrates short run adjustments with long run equilibrium without losing long run information and error correction term shows how much of the disequilibrium is being corrected, that is, the extent to which any disequilibrium in the previous period is being adjusted in year

The purpose of this study is to analyze the effect of climate change on agriculture output in Ethiopia. The study starts with the important work; neo-classical growth model developed by Solow (1956).The neo-classical production function is specified in terms of traditional inputs like labor and capital. The following neoclassical production function was used. The advantage of this approach is that it controls explicitly for other inputs as indicated by (Deschenes and Greenstone 2004), However, its disadvantage lies in the fact that it does not take in to account of the full range of compensatory responses to changes in climate made by farmers(Barrios et al 2007).

$$Yt = f(Lt\ Kt) \quad \text{....(4)}$$

Where Yt is aggregate real output, Lt is labor and kt is capital inputs
The model is specified as the following

$$Y(t) = f(L, AT, MAR, F, AL) \quad \text{.....(5)}$$

Where Y(t)(RAGDP) is real agricultural domestic growth product, L labor force, AT Average temperature, MAR mean annual rainfall, F fertilizer input import and AL Agricultural land.
Then converting to natural logarithm the model is

$$\log(RAGDP) = \beta o + \beta 1 \log(LF) + \beta 2 \log(AT) + \beta 3 \log(MAR) + \beta 5 \log(AL) + \beta 6 \log(F) + \varepsilon t \quad \text{.....(6)}$$

Where logRAGDP=natural logarithm of Real agricultural growth domestic product
Log LF=natural logarithm of labor force
LogAT= natural logarithm of Mean Annual temperature
LogAR= natural logarithm of Mean Annual rainfall
LogAL=natural logarithm of Agricultural land
Log F=natural logarithm of fertilizer input import
et=error term and $\beta 0$ are constant term while $\beta 1, \beta 2, \beta 3, \beta 4, \beta 5,$ and $\beta 6$ are parameter of independent variable to be estimated.

Table 2. Definition of variable and expected sign

Variable	Description	Expected sign
Real Agricultural gross domestic product	total produce of the agricultural sector in the economy in a given year	
Labor force	Labor force (age from 15-64 years) a total number of labor force that are economically active.	positive
Average temperature	is annual temperature is averaged over 12 months of temperature that the country receive	Negative
Mean Annual rainfall	rainfall that the country receives in 12 months taken as an average over those months throughout the years	Positive
Agricultural land	The share of land area that is arable, under permanent crops, and under permanent pastures.	Positive
Fertilizer input import	Fertilizer is the ingredient which increases the productivity of agricultural products	positive

RESULT AND DISCUSSION

Unit root test result

Before measuring a model Time series data ought to be checked. Based on unit root test This study employed ADF unit root test to check stationarity of data. The stationarirty of the data shows that or order of integration is mixed I(0) and I(1) which leads us to use ARDL model.

Table 3. Result of unit root test based on Augmented Dickey Fuller at level and First difference

Variable	With intercept and no trend		With intercept and trend		Order of integration
	At levels	First difference	At levels	First difference	
Log(RAGDP)	0.22919	9.264041**	5.124627***	9.450906***	I(1)
Log(MAR)	4.993207**	7.939576***	5.866566***	7.957953**	I(0)
Log(LF)	0.751465	3.767619**	3.767619 **	7.715934***	I(1)
Log(FI)	0.246291	10.98597***	4.405396**	11.11200***	I(1)
Log(AL)	1.58964	5.488356***	0.952445	5.686601***	I(1)
Log(AT)	2.6790818*	5.953295**	3.32928*	5.877539**	I(0)

*Source: author calculation, 2018 Notes: The rejection of the null hypothesis is based on MacKinnon (1996) critical values Null hypothesis: series has unit root. *Rejection at 1% level. ** Rejection at 10% &5 % and *** Rejection at (1%, 5% & 10%) level.*

Selecting optimal lag length

Most important thing is selecting order of the model that result in a good model that gives a good result and good forecast. Optimum number of lag that would be included in the model is known as order of the VAR model. Different types of lag selection criteria are there for the selection of the lag order. Those are, which includes the sequential modified likelihood ratio (LR), Akaike information criteria (AIC),Final prediction error (FPE), Schwarz information criterion(SC) and Hannan-Quinn information criterion(HQIC). The following table shows the lag length chosen by different information criteria. The study used two lag length based on LR.

Table 4. Results of lag order selection criteria

Lag	logL	LR	FPE	AIC	SC	HQ
0	142.3707	NA	1.32e-11	-8.021806	-7.752445	-7.129947
1	270.639	201.7089	6.02e-14	-13.44893	-11.56343*	-12.80592
2	324.2405	66.2248*	2.64e-14	-14.48474	-10.98309	-13.29057
3	381.7345	50.72994	1.39e-14	15.74956	-10.63129	-14.00377

*Source: author calculation, 2016 *indicates the lag length selected by the criteria*

ARDL bound test to co integration result

Based on likelihood ratio (LR) lag length criteria for the model bound test is applied so as to find the presence of long run relationship among the variables included in the model and test is as displayed here.

Table 5. Bound test result

Variable	F-statistics	Co integration
F(RAGDP, LF, MAR, FI,AL,AT)	9.686542***	Co integration
Critical value	Lower bound	Upper bound
1%	3.41	4.68
5%	2.62	3.79
10%	2.26	3.35

*Source: author calculation, 2016 *** rejection of null hypothesis no co integration at 1%, 5%, and 10% significance level.*

The table reveals that F-statistics 9.686542 which exceed the upper bound at 1%, 5%, and 10% critical value and this implies there is a long run relationship among variables in the model.

Estimation of long run model result

Effect of mean annual rainfall on agricultural output; since the formulated econometric equation is in log-log form, the coefficients is interpreted as elasticity or responsiveness of change. The findings in table 5 Reveal that mean annual rainfall have a positive and significant effect on agricultural output measured by RAGDP. The result indicating that 1 percent increase in mean annual rainfall increases agricultural output by 0.56 percent or 1mm increase or change in rainfall leads to an increase of RAGDP by 0.56% in the long run. This result suggests that rainfall is the most important in determining agricultural output which is the major contributor to economic growth and it is consistent with result by Barrios, et al (2007) in Sub Saharan Africa they found that if rainfall is decline it would reduce agricultural output and if rainfall increase agricultural output would be increase in SSA. This shows rainfall is major factors that determine agricultural output in SSA. Rainfall in Ethiopia is a major input in determining output due to this the country is named as rain fed economy, where rainfall play an important role. In addition this result is go in line with Muraya & Ruigu (2017) where they found that rainfall affect positively and significant relationship with agricultural productivity in the long run.

Table 6. Estimation of long run model ARDL result Dependent variable is log(RAGDP)

Variable	Coefficient	Standard error	t-statistics	p-value
Log(MAR)	0.5675	0.159450	3.559667	0.0014**
Log(AT)	-2.56001	0.663537	-3.858147	0.0006**
Log(LF)	0.959257	0.125867	7.621193	0.0000***
Log(AL)	0.313009	0.091934	3.404700	0.0021***
Log(FI)	0.202502	0.043884	4.614436	0.0001***
Constant	9.215554	2.071634	4.4484470	0.0000***

*Source: Author calculation, 2016 ***, **, *significant at 5%, 10%, and 1%.*

R^2 =0.987 Adj R^2=0.983 DW=2.03609 F statistics=269.1345 Prob (F-statics)=0.0000

Effect of temperature on agricultural output; the results indicate that average temperature have a negative effect on agricultural output and significantly reduce agricultural output. A one percent increase in average temperature would reduce agricultural output by 2.5% in the long run. The long run elasticity of agricultural output with respect to average temperature is -2.5 indicating that agricultural output is most sensitive to an increase in average temperature in the long run, this due to an increase in temperature change will likely result in decreasing agricultural productivity. This may be that high temperature depletes soil nutrient making it hard on livestock and agricultural output generally. In the long run increase in temperature reduces soil moisture that negatively affects crop production which reduces agricultural output. in short term temperature increase may increase crop productivity and others output, but in long term result in heat stress, reduction of water, reduction of feed resources livestock, and agriculture production failure that leads to reduction of agricultural output which directly affect country economy generally and rural and urban population particularly through increasing price of agricultural output for urban population.

Effect of labor force on agricultural output; as agricultural sector absorb major part of labor force contributing around 72.7% of employment in the economy. In the long run the effect labor force on agricultural output is positive and significant at all levels. In the long run there would be change in occupation of labor from traditional to educated labor that produce more output in agriculture sector. This would cause agricultural output to be positively affected by labor force. And it goes the same direction with agricultural output. A 1percent increase in labor force would result in increase of agricultural output by 0.95% percent and its significant at all levels.

Effect of fertilizer input import on agricultural output; Fertilizer is the main input in agriculture sector especially for crop production that would increase agricultural output. As table shows it have positive effect on agricultural output as it increase agricultural output and it have significant effect on it. A 1 percent increase in fertilizer input import would lead to 0.20% increase in agricultural output. An increase in the fertilizer import over a period increases the output. An increase in the fertilizer input import which means an increase of in its consumption in other words increase output of crop production particularly and increase agricultural output generally. An increase in agricultural output leads to an increase of overall GDP and improve the living standard of rural population whose their livelihoods are dependent on agriculture. If there is an increase in agricultural output it increases export of the country which leads to gain of foreign exchange to the country. This result is similar with Tekeste (2012) who used fertilizer input import as control variable and he found positive and significant effect on agricultural export through effect on agricultural output.

Effect of agricultural land on agricultural output; The long run result indicate that indicate that 1% increase in agricultural land leads to 0.31% increase in agricultural output since agricultural land play an important role in determining agricultural output

where there is an increase in agricultural land there would be increase in output and it have significant effect on agricultural output that result in increase in gross domestic product in general.

Error correction representation of ARDL result

Error correction model shows by how much yearly adjustment would be made if there is dis- equilibrium in the previous year and shows short run effect of variables on the dependent variables.

Table 6. Error correction result dependent variable is LD (RAGDP)

Variable	Coefficient	Standard error	T statistics	P value
LD(MAR)	0.419322	0.121361	3.455157	0.0018**
LD(LF)	0.708676	0.093313	7.594582	0.0000**
LD(FI)	0.057706	0.027364	2.10889	0.0444
LD(AT)	-0.048664	0.459323	-0.105947	0.9164
LD(AL)	0.231243	0.067514	3.425102	0.0020**
ECT-1	-0.738778	0.070093	-10.539989	0.0000**

*L- is refers to logarithm D- lagged difference. *, ** and *** indicates significance at the 10, 5 and 1 percent levels.*

The short run result shows that last year mean annual rainfall have positive and significant impact on agricultural output while last year temperature have negatively affect agricultural output but it have insignificant effect on agricultural output, Where as other variables have positive impact on agricultural output. The error correction terms represent speed of adjustment towards the long run equilibrium. This coefficient term indicate that 73.8% of the disequilibrium in the previous period is corrected in one year.

Diagnostic test result

In order to know the validity of the short-run and long-run estimation in the ARDL model, the diagnostic tests like Serial correlation test (Brush & Godfray LM test), Heteroscedasticity test (Breusch and Godfray LM test), Normality (Jaque-Bera test), Functional form (Ramseys RESET) and multicollinearity test(VIF) test were performed. The tests and their respective statistics are shortened by Table 7.

Table 7. Diagnostic test result

Test	LM version		F-version	
	Statistic	P-value	Statistic	P-value
Normality: Jarque-Bera test	x^2 (2)0.07865	0.8997	not applicable	
Serial Correlation: Breusch-Godfrey serial correlation LM test	x^2(2)14.8009	0.0006	F(1,26) 0.0122	0.9130
Heteroskedasticity:Breusch-Godfrey test	x^2(2)13.79060	0.0721	F(1,28) 0.0721	2.0957
Ramsey RESET test	x^2(26)0.56478	0.3682	F(1,26) 0.0165	0.8987
Multicollinearity test: Mean VIF (3.27)				

To test for normality of the residual the study used Jarque-Bera normality test. As the result in the table the P-value of the equation is greater than 5%. Therefore, the study failed to reject the null hypothesis and conclude that error terms of the specified model are normally distributed. To check whether model have heteroscedasticity this study used Breusch-pagan-Godfrey test. Accordingly the p-values of the equations is above the critical value (5%), implying that the residuals of the equations have no problem of heteroscedasticity. Under Breusch-Godfrey serial correlation test result shown in the table above, for the model their p-value is greater than 5% in case of LM version which assures that there is no serial correlation problem and the study accepts the null hypothesis, therefore there is no serial correlation between residuals under this

study . in addition the study conducted Multicollinearity test by VIF shows mean VIF is less than 10 which shows there is no multicollinearity exist among variables.

Model stability

In addition to the above tests, the stability of long run estimates should be tested by applying the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMSQ) test. Since the test statistics of this stability tests can be graphed, we can identify not only their significance but also at what point of time a possible instability (structural break) occurred. If the plot of CUSUM and CUSUMSQ statistic moves between the critical bounds (at 5%significance level), then the estimated coefficients are said to be stable.

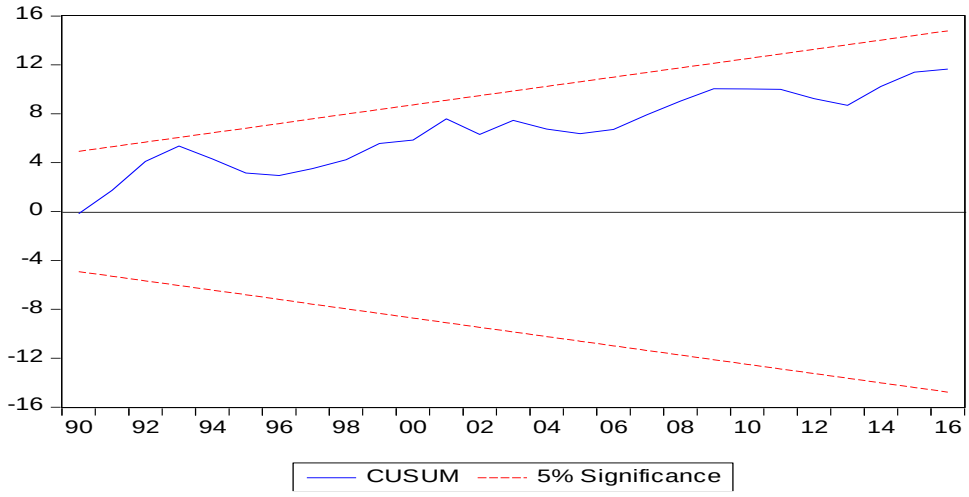

Figure 1. Plot of cumulative sum of recursive residuals

Note: *The straight lines represent critical bounds at 5% significance level*

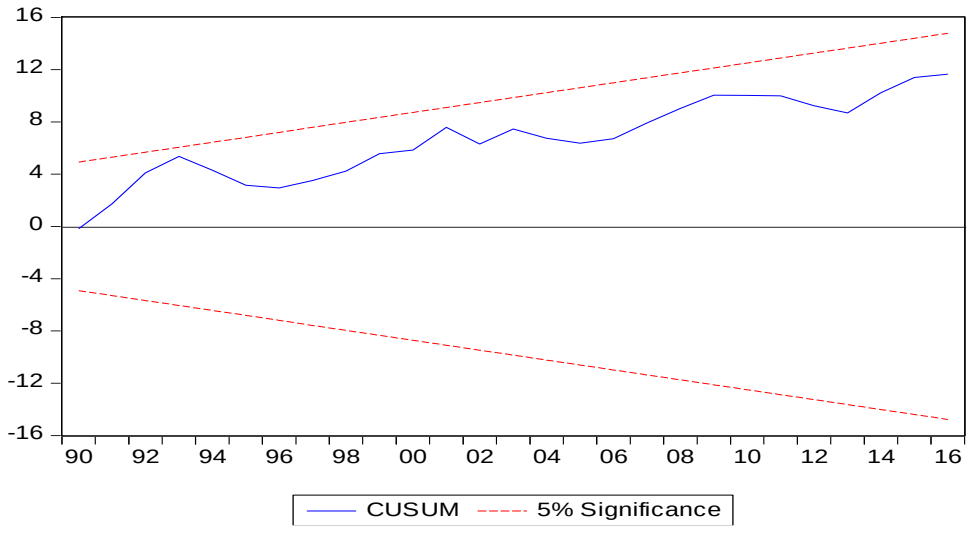

Figure 2. Plot of cumulative sum of squares of recursive residuals

Note: *The straight lines represent critical bounds at 5% significance level. As can be seen from both figure, the plot of CUSUM test did not cross the critical limits and CUSUMSQ test shows that the graphs do not cross the lower and upper critical limits Similarly,. So, we can conclude that long and short runs estimates are stable which shows the results of the estimated model are reliable and efficient.*

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The main objective of the study was to analyze effect of climate change on agricultural output in Ethiopia using real agricultural gross domestic product as proxy for agricultural output. The study used ARDL approach to co integration. The main finding of this study is that in the long run climate change proxied by mean annual rainfall and average temperature has an impact on agricultural output. In the long run mean annual rainfall has a positive and significant effect on agricultural output, whereas average temperatures have a negative and significant effect on agriculture output. In other words, holding other thing remaining constant, one percent increase in mean annual rainfall has resulted in 0.56% RAGDP in the long run, However one percent increase in temperature has resulted 2.56% reduction of RAGDP. In short run coefficient of error correction -0.738 suggesting about 73.8% annual adjustment towards long run equilibrium. This shows there is existence of stable long run relationship among variables. The estimated short run reveals that rainfall has a positive impact on agricultural output, whereas average temperatures have a negative impact on agricultural output but, unlike its long run significant impact temperatures has no significant short run impact on agricultural output.

Recommendations

In order to reduce effect of climate change in the long run and short run mitigation and adaptation strategies should be in place. Adaptation strategies may focus on the option of producing or water harvesting as it rains instead of waiting for the traditional seasons of agricultural activities. Adaptation is important in long run whereas mitigation play an important role in short run. In addition to this government, and other stakeholders should make agricultural sector a climate change resilient by using different technology and providing sufficient and timely information for farmers on climate forecast both at macro and micro level. Diversifying the economy to climate resistant sector to Minimize dependence on rainfall economy.

REFERENCE

Agricultural Transformation Agency (ATA). (2016), *Annual report on agricultural output* Addis Ababa, Ethiopia

Akram, N. & Hamid, A. (2015). *Climate change: A threat to the economic growth of Pakistan. Progress in Development Studies*, 15(1), 73-86

Alagidede, P., Adu, G. & Frimpong, P.Boakye (2014) The Effect of Climate Change on Economic Growth: Evidence from Sub-Saharan Africa. *WIDER Working Paper* 2014/017. Helsinki: UNU-WIDER

Ali S. N. (2012). *Climate Change and Economic Growth in a Rain-Fed Economy: How Much Does Rainfall Variability Cost Ethiopia?* Available at SSRN: https://ssrn.com/abstract=2018233 or http://dx.doi.org/10.2139/ssrn.2018233

Barrios, S. & Ouattara, B. & Strobl, E. (2008). The Impact of Climatic Change on Agricultural Production: Is it different for Africa? *Food Policy*. 33, 287-298.

Brooks, C. (2008). Univariatetime series modeling and forecasting. Introductory Econometrics for Finance. 2nd Ed. *Cambridge University Press. Cambridge, Massachusetts.*

Deressa, T.T. (2007). *Measuring the Economic Impact of Climate Change on Ethiopian Agriculture: Ricardian Approach*. World Bank Policy Research Working Paper No.4342.

Deschenes, O., & Greenstone, M. (2004). *The Economic Impacts of Climate Change: Evidence from Agricultural Profits and Random.* NBER Working Paper Series No. 10663. Cambridge: National Bureau of Economic Research American Economic Review.

Enders, W.(1996). *Applied Econometric Time Series*. Lowa State University: John Wiley & Sons INC

Engle, R. F. & Granger, C.W.J. (1987). Co-integration and Error Corrections: Representation, Estimation and Testing. *Econometrica,* 55(2), 251-276

Ferede T, Ayenew B &. Hanjra A(2010) Agroecology Matters: *Impacts Of Climate Change On Agriculture And Its Implications For Food Security In Ethiopia*. In Hanjra, Munir A. (Ed.). Global food security: emerging issues and economic implications. New York, NY, USA: Nova Science Publishers.

Gebreegziabher, Z., Stage, J., Mekonnen, A. & Alemu, A. (2016). Climate change and the Ethiopian economy: a CGE analysis, *Environment and Development Economics,* 21(2), 205-225.

Granger, C. W. J. & Newbold, P. (1974). Spurious Regressions in Econometrics. *Journal of Econometrics,* 2, 111-120

International Monetary Fund (IMF). (2016) *Country Report of Federal democratic Republic Ethiopia*. Washington D.C: IMF

Intergovernmental Panel on Climate Change (IPCC). (2014). *Climate change report adaption, impact and vulnerability regional aspects synthesis repor*t, in Pachauri R.K, & L.A Meyer(eds), Contribution of working groups I,II and III to fifth Assessment report of intergovernmental panel on climate change' Switzerland: IPCC Geneva

Intergovernmental Panel on Climate Change (IPCC). (2007b, November) *Climate Change 2007: Synthesis Report*, in Pachauri R. K., Reisinger A.(eds), Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Vol. 446. Switzerland: IPCC Geneva.

Jonathan E. O. & , Emmanuel I. E. (2017) The Impact of Climate Change on the Nigerian Economy, *International Journal of Energy Economics and Policy,* 7(2), 217 - 223

Muraya, B.W. & Ruigu, G. (2017). Determinants of agricultural productivity in Kenya. *International Journal of Economics, commerce and management, 5(4), 159 - 179*

National Meteorological Agency (NMA). (2007), *Climate Change National Adaptation Program of Action (NAPA) of Ethiopia*, NMS, Addis Ababa, Ethiopia

Pesaran, M. H. & Smith, R.P (1998). Structural analysis of co integration VARS. *Journal of economic surveys,* 12(5), 471-505

Pesaran M.H, R.J. Smith, & Y. Shin,(1996) Testing for the Existence of a long run Relationship, DAE Working paper No.9622, *Department of Applied Economics, University of Cambridge*

Solow, R. (1956). A Contribution to the Theory of Economic Growth. *Quarterly Journal of Economics,* 70(1), 65-94

Tekeste, S. (2012). *Determinants of agricultural export performance in Ethiopia,* (Master thesis) Addis Ababa University, Ethiopia.

United States Agency for International Development (USAID). (2013). *Ethiopia climate vulnerability profile*. Available: https://www.climatelinks.org/resources/ethiopia-climate-vulnerability-profile

World Bank. (2008). *Ethiopia - A Country Study on the Economic Impacts of Climate Change*. Washington, DC: World Bank.

Yalew, A.W. (2016) *Economy-wide Effects of Climate Change in Ethiopia*. Paper to be presented at International Conference on Economic Modeling, Lisbon Portugal

Zhai, F. & Zhuang, J. (2012). *Agricultural Impact of Climate Change: A General Equilibrium Analysis with Special Reference to Southeast Asia*. ADBI Working Paper Series No. 131. Tokyo: Asian Development Bank Institute. Available: http://www.adbi.org/workingpaper/2009/02/23/2887.agricultural.impact.climate.change

Autoregressive Distributed Lag (ARDL) approach for re-testing the Fisher effect in Indonesia

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Abstract

This article discusses about re-testing the validity of the Fisher hypothesis in Indonesia. By using Autoregressive Distributed Lag (ARDL) approach, we will know if there is any causality between interest rate and inflation or not, for the long-term relationship. Interest rate divided into two main points, real interest rate and nominal interest rate. Hence, there are three main variables for this research, inflation, real interest rate and nominal interest rate. We applied the bound test to know cointegration between variables. The result shows that there is no evidence of long-term relationship and short term relationship between nominal interest rate and inflation in Indonesia.

Keywords: *Autoregressive Distributed Lag, Fisher hypothesis, Inflation, Interest rate*

JEL Classification: E31, E43, C32.

INTRODUCTION

Fisher effect theory which discusses the relationship between interest rates and inflation in the long run continues to be tested through empirical studies in various countries (Everaert, 2014; İncekara et al., 2012). This is done as a form of testing whether thetheory is *Fisher effect* still considered valid or not with empirical studies in the country under study. The invalidity of this theory can occur given the growth of inflation and interest rates in each country is different, it is influenced by several fundamental economic factors. Some fiscal and monetary policies can also have an influence on the economic fundamental factors which will also have an impact on inflation and changes in interest rates.

Research conducted by (Benazić, 2013) shows that the Fisher Effect theory is still valid in Croatia in the period of research from 1996 to 2012. In that study (Benazić, 2013) using the VECM (Vector Error Correction Model) method and found thattheory *Fisher Effect* occurs entirely in the country of Croatia and only occurs in the long run. Then, (Zainal et al., 2014) in his study showed the validity of Fisher's hypothesis by testing the relationship between inflation and interest rates on the Malaysian Money Market. This study uses the ARDL econometrics methodology introduced by (Pesaran et al., 2001). Overall, the estimation results on *treasury bills* Malaysianand interbank

interest rates indicate that there is a long-term *Fisher effect* on the Malaysian money market.

Research conducted by (Yaya, 2015) in countries on the African continent found that of the ten countries studied, there was a long-term relationship between nominal interest rates and inflation in only three countries. The estimated long-term relationship of the perfect Fisher effect only occurs in Kenya. (Yaya, 2015) also found a positive relationship but less than areaction *one-for-one* to inflation rates in Cote d'Ivoire and Gabon, so these two countries are referred to as adherents to the *Fisher effect* partial. For the other seven countries, there is a result that there is no evidence or evidence of a long-term relationship between nominal interest rates and inflation. Researchers conducted by (Caporale & Gil-Alaña, 2019) using themethods *Univariate and Multivariate Analysis* found that thetheory *Fisher Effect* in the G-7 countries was not appropriate this is evidenced by the positive relationship between interest rates and inflation rates in the G country -7 but the relationship does not have a long-term relationship as hypothesized by Fisher.

Indonesia is one of the developing countries in Asia that has macroeconomic conditions including inflation and interest rates that are quite volatile. Fluctuations that arise due to economic conditions in the State of Indonesia itself, given the span of years from 2008 to 2017 there is a phenomenon of the global financial crisis which certainly has an impact on the economy in various continents including the Asian Continent and the countries in it including Indonesia. The global monetary crisis of 2007/2008 in the United States impacted the world economic slowdown, which was preceded by the weakening of financial markets in industrialized countries and developed countries which caused most of the capital outflow to *flow out*, the impact also increasingly spreading to developing countries which then had an impact in the real sector (Bayoumi et al., 2010).

The impact of the 2007-2008 monetary crisis began to be felt in Indonesia in the fourth quarter of 2008 by marking the decline in the rupiah exchange rate, the decline in international trade and capital flows which became one of the sectors driving economic growth (BAPPENAS, 2009). These conditions also impacted the country's economic fundamentals such as economic growth, inflation rates, interest rates, and several other aspects of the economy that experienced considerable fluctuations. Therefore, the government together with Bank Indonesia issued various policies to control the impact of the crisis and improve economic conditions including controlling people's purchasing power by controlling inflation and providing various leeway to the banking sector and financial (BAPPENAS, 2009). The impact caused by the crisis is still ongoing in the next few years so that the government continues to implement various policies to anticipate these conditions. The impact was also caused by policy changes made by various trading partner countries and developed countries so that the government and Bank Indonesia continue to make policy adjustments to maintain and encourage economic growth. Therefore we need a review of thetheory *Fisher Effect* in Indonesia in the period 2008-2017.

METHODS

Fisher hypothesis stated that in the long term, there was a one-to-one relation between nominal interest rate and inflation expectation level. The proportion was described through the following identity function,

$$R_t = r_t^e + \pi_t^e \quad \text{.....(1)}$$

Where R_t represented the nominal interest rate on period t. r_t^e was the ex-ante real interest, and $\pi_t^e$was the inflation expectation level. By the existence of monetary illusion, any full change shall be transmitted to the nominal interest rate, r_t^ehad constant value in the long term. In general, rational expectation assumption, inflation expectation level was equal to the actual inflation plus estimated zero error term,

$\pi_t^e = \pi_t + \varepsilon_t$ ..... (2)

Finally, the obtained empirical equation is in the following form

$R_t = \alpha + \beta r + \beta\pi_t + \mu_t$ ..... (3)

Where β was the interest rate coefficient which the value is expected to be equal to one. The estimation of β was not significantly different from one which indicated the strong shape of Fisher hypothesis. When the value indicated lower than one then it was called partial Fisher effect.

The data used in this study was the annual data of the Republic of Indonesia. Variables included in this study were nominal interest rate and inflation. The inflation was calculated as the percentage change of Consumer Price Index/CPI in one year. The data will be taken through the World Development Indicator on the World Bank. Beside using annual data, this study took different sample amount in each country depended on the data availability of the referred source.

The model specification in equation (3) was re-described in equation (4) where the equation had included the state element as follows:

$R_{it} = \alpha + \beta\pi_{it} + \varepsilon_t$ ..... (4)

With R_{it} showed the nominal interest rate of Indonesia, π_{it} as actual inflation of Indonesia and ε_t as Error Term. The econometrics modeling in equation (4) were two models which would be used in this study to compare the analysis result of Indonesia as the object of this study.

A new co-integration technique has been developed by (Pesaran et al., 2001)based on the Autoregressive Distributed Lag (ARDL) model. This technique had more advantage than the standard method. This technique could avoid the trouble caused by the conventional root unit testing result as well as the small sample usage which caused the less significant test result. This technique could also solve the endogenity problem and incapability in providing hypothesis of estimated coefficient in the long term which is related to the Engle-Granger method. Finally, the use of ARDL method was certainly able to investigate the long term relation between nominal interest rate and inflation.

The Bound Testing was started by Vector Autoregressive (VAR) on the level,

$Y_t = \mu + \sum_{j=1}^{p} \emptyset j\ Y_{t-j} + \varepsilon t$ .....(5)

Where $Y_t = [i_t\ \varepsilon_t]`$. The Vector Error form was $\varepsilon = [\varepsilon_i, \varepsilon_\pi]` \sim N(0, \Omega)$ where Ω was positive,

$\Omega = \begin{bmatrix} \omega ii & \omega i\pi \\ \omega i\pi & \omega\pi\pi \end{bmatrix}$ .....(6)

Manipulation of equation (6) made the VAR model more specified into *vector error correction model* (VECM)

$\Delta Yt = \mu + \lambda Y_{t-1} + \sum_{j=1}^{p-1} \gamma\ \Delta Y_{t-j} + \varepsilon_t$ ..... (7)

Where the short term coefficient

$$\gamma j = \begin{bmatrix} \gamma ii,j & \gamma i\pi,j \\ \gamma \pi i,j & \gamma \pi\pi.j \end{bmatrix} = -\sum_{k=j+1}^{p} \emptyset k \quad \text{.....(8)}$$

Coefficient λ in the long term multiplier matrix was as follows

$$\lambda = \begin{bmatrix} \lambda ii & \lambda i\pi \\ \lambda \pi i & \lambda \pi\pi \end{bmatrix} = -I2 - \sum_{j-1}^{P} \emptyset j \quad \text{.....(9)}$$

Where I_2 was the identity matrix 2x2. Under this assumption, the nominal interest rate equation could be written as follows:

$$\Delta i_t = \theta_0\theta_1 i_{t-1} + \theta_2\pi_{t-1} + \sum_{i=0}^{n} \gamma 1i\, \Delta i_{t-i} + \sum_{i=0}^{n} \gamma 2i\, \Delta\pi_{t-i} + \mu t \quad \text{..... (10)}$$

The co-integration between nominal interest rate and inflation was tested through lag variable limitation and the interception of the equation above was equal to zero. This hypothesis was tested by F-statistic average. (Pesaran et al., 2001) suggested that the use of Cumulative Sum of Recursive Residuals (CUSUM) and Cumulative Sum of Squares of Recursive Residual (CUSUMQ) was aimed to estimate the parameter consistency level on a model.

RESULTS AND DISCUSSION

Descriptive statistics analysis results

Distribution of a general picture of each variable used in the study can be explained individually through the display of *mean, median, maximum, minimum, standard deviation, skweness, kurtosis, Jarque-Bera* and *probability*. This is in accordance with the research variables conducted, which is to see how the causality or relationship between inflation and interest rates in Indonesia.

Table 1. Indonesian descriptive analysis results

	IR^I	INF^I	RIR^I
Mean	6.636417	5.709417	0.414518
Median	6.500000	4.860000	0.537201
Maximum	9.500000	12.14000	0.786550
Minimum	4.250000	2.410000	-1, 104829
Standard Deviation	1.198594	2.3331237	0.374837
Skewness	0.043008	0.929976	-1,800650
	IR^I	INF^I	RIR^I
Kurtosis	2.688767	3.309073	6.138971
Jarque-Bera	0.521325	17.77474	114, 1125
Probability	0.770541	0.000138	0.000000

In Table 1. shown the results of descriptive statistical analysis of each variable used in testing regarding causality or the relationship between inflation and interest rates in Indonesia with time vulnerable from 2008-2017. In this case there are three variables namely Indonesian IR (*Interest Rate*), INF (*Inflation*) Indonesia, and RIR (*Real Interest Rate*) of Indonesia.

Autoregressive Distributed Lag (ARDL) estimation results

The Bound Testing co-integration test was used to detect the long term balance on a research model. Detecting long term balance was conducted through comparing critical value and F-statistics on the testing result. Independent variable which was integrated to I(0) was assumed as the lower bound while the independent variable which is integrated to I(1)was assumed as the upper bound. There will not be a co-integration

if the F-statistics value is below the lower bound and co-integration will occur if it is above the upper bound. However, if the F-statistics value is between the lower and upper bound then the co-integration test can not be concluded.

Table 2. Bound testing result

Model	*F-Statistic*	Significant	*Lower Bound*	*Upper Bound*
Interest Rate (IRi)	13,37441	10%	3.17	4.14
		5%	3.79	4.85**
		2,5%	4.41	5.52***
		1%	5.15	6.36****

Notes: *) Significant on 10%, **) Significant on 5%, ***) Significant on 2.5%, ****) Significant on 1%

Based on Table 2, the result showed that the Bound Test was known from the Fisher Effect model in Indonesia (IRi) on the level of significance 5%, 2.5%, and 1%. The F-statistic value was higher than the lower and upper bound value which means there was a co-integration among variables of the Fisher Effect in Indonesia. That it means there was a short term balance which moved to the long term in every variable on the model. However, bound test was not the last test to determine the Fisher Effect validity. The long term and short term estimation test should also be conducted to get more valid result.

Lag length determination test was important in a test using ARDL bound testing method to determine the maximum lag and optimum lag. The optimum lag test was aimed to obtain the appropriate lag length which will be used to determine the best lag length to formulate the ARDL model and to measure the effect of a variable in affecting other variables in a model. The study of optimum lag test could use Akaike Information Criterion (AIC) and Schwarz Bayesian Criterion (SC). In this study using the optimum lag test with the Akaike Information Criterion (AIC) approach.

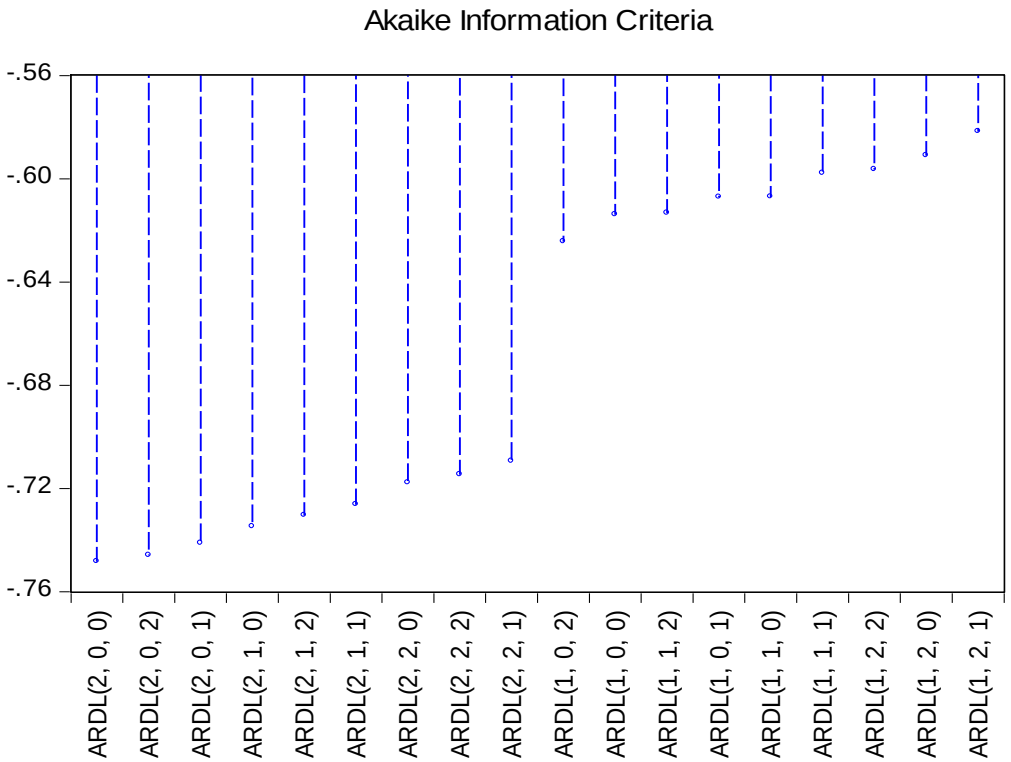

Figure 1. Optimum lag result

Based on Figure 1 optimum lag result showed that by using Akaike Information Criterion (AIC) approach, the best and most appropriate model is ARDL (1,2,1) with lower error rate than the other model. It means, the value of Y was 1 lag, X1 was 2 lags, and X2 was 1 lag.

After determining optimum lag and confirming that the model was co-integrated, the next step was conducting long term estimation to determine the co-integration relation in each variable in the ARDL model. The ARDL specification was used along with Akaike Information Criterion (AIC) approach based on the optimum lag testing result.

Table 3. The result of ARDL long term coefficient Fisher effect estimation (2,0,0)

Variable	Coefficient	Std. Error	t-statistic	Probability
INFI	0.547977	0.113012	4.848844	0.0000
RIRI	-0.752176	0.738632	-1.018337	0.3107
C	3.576756	0.834832	4.284403	0.0000

Based on Table 3, the analysis result showed that the long term estimation of inflation had a positive significant effect on Fisher Effect. However the interest rate had a negative significant relation to Fisher Effect. That in this case, the estimation result stated that in the long term inflation and real interest rate had no significant positive effect on Fisher Effect. That was due to the two variables showed different results that indicated the whole independent variables (X1 X2) had a negative effect on the dependent variable (Y) interest rate (IRi).

Empirically, the negative effect on interest rate variable in the Fisher effect model in 2008 until 2017 was caused by the change on the policy which regulated the interest rate. In 2008 until mid-2016, the implemented interest rate policy was the BI Rate, however on August 2016 the interest rate policy was changed into 7 Days Repo Rate.

In determining the short term among variables in the model, we used ARDL bound testing approach. Table 4 was the short term estimation result on the Fisher Effect model with ARDL as the fittest model (2,0,0).

Table 4. The result of ARDL short term coefficient *Fisher Effect* estimation (2,0,0)

Variable	Coefficient	Std. Error	t-statistic	Probability
D(IRI(-1))	0.357815	0.083251	4.298014	0.0000
D(INFI)	0.039204	0.010301	3.806023	0.0002
D(RIRI)	-0.053814	0.050959	-1.056024	0.2932
CointEq(-1)	-0.071544	0.018367	-3.895269	0.0002

Cointeq = IRI - (0,5480*INFI – 0,7522*RIRI) + 3,5768

From the short term estimation result, the CointEq was -0,071544 with 0,0002 probability, which means the model was co-integrated. The negative value of β showed that the model will reach balance with 7,15 percent speed per month.

According to the empirical study, inflation and nominal interest rate had significant positive relation in the Fisher Effect model. That was due to in the short term, the number of inflation and interest rate in 2008 until 2017 by using monthly data was considered as stable.

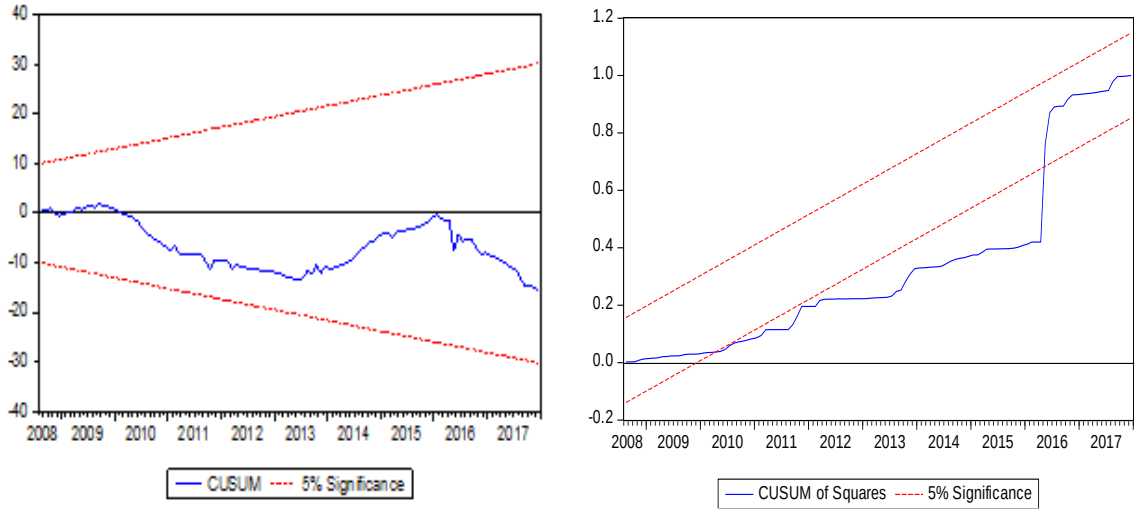

Figure 2. The result of CUSUM and CUSUMQ testing with *Recursive Residual* approach

Next, a model stability test was conducted to detect the stable model certainty movement on its parameter coefficient. This test used two kinds of test, the CUSUM and CUSUMQ tests. CUSUM test was conducted through recursive residual approach, while the CUSUMQ was conducted through recursive residual approach where its R^2 had been adjusted (Adjusted R^2).

Based on Figure 2, the model stability test result by using CUSUM and CUSUMQ showed that the Fisher Effect was stable because the CUSUM line was inside the significant border of 5% (red). The different result was obtained from the CUSUMQ where the result was considered as unstable because the CUSUMQ line was outside the significant border of 5% (red).

Fisher effect was a conception where the interest rate and inflation were considered to have a positive relation where both were influencing each other. Some theoretical models assumed that Fisher hypothesis was valid. However, although there had been many empirical supports on the hypothesis, in fact it was difficult to prove regarding there were many studies in some countries which rejected the Fisher effect hypothesis. Based on the previous study such as the study of (Yaya, 2015) in the African countries found that from 10 observed countries, only three of them indicated the long term relation between nominal interest rate and inflation. The perfect estimation of Fisher effect long term relation only happened in Kenya. He also found a positive insignificant relation of one-for-one reaction on the inflation in Cote d'Ivoire and Gabon, that these two countries were considered implementing partial Fisher effect. And seven other countries indicated that there were not any facts or evidence of the long term relation between nominal interest rate and inflation. Other researcher (R., Santos Alimi, Bernad O, 2001) found that there were not any facts or evidence of Fisher effect in Nigeria. Although there was a long term relation among variables (amount of circulated money, real income, price and nominal interest rate), but causality did not explain the strong relation between inflation and interest as stated by Fisher hypothesis.

Based on the result, Indonesia was a country which empirically considered that Fisher effect was invalid. It was proved by the Bound Test result through ARDL approach which showed negative value which means there was not any long term

relation between nominal interest rate and inflation. The invalid Fisher effect in Indonesia proved that the interest rate did not have the one-to-one basis with the inflation. Basically, inflation rate stabilization was the main goal of the monetary policy in various countries including Indonesia. Maintaining price stability did not only use the interest rate, but also the other instrument such as exchange rate.

Through the study, the result showed that in the short term, the nominal interest rate and inflation had a positive significant relation to the Fisher Effect model. However, in the long term, Fisher Effect was considered as invalid (Caporale & Gil-Alaña, 2019). That was because in the long term, the interest rate showed negative significant result in the Fisher effect model. The invalid Fisher effect in Indonesia in the long term had several possibilities which could make it happen. One of them was the policy change which was stated in the interest rate instrument, where in the study period of 2008 until 2017, there was a change on the policy of interest rate determination which initially used BI Rate into 7 Days Repo Rate on August 2016.

From various literatures and previous studies, the long term relation between inflation and nominal interest rate tend to go hand in hand that it is called Fisher effect. The concept of Fisher effect was introduced by Irving Fisher in the 20th century. He explained that interest has an important role in monetary policy and inflation as the goal of monetary policy. However, some studies also mentioned that the observed country did not implement the Fisher effect concept. The invalid Fisher effect either in the short term or long term in the interest rate variable reflected the change on the real interest rate and actual inflation value which were important as the reflection of monetary policy stance where the interest rate either in the short term or long term was incapable to provide appropriate and accurate description for the monetary policy by maintaining high interest rate in the certain period as the indication of high inflation expectation. Therefore in this case, the Fisher Effect invalidity concluded that by implementing those ways above, in fact, the monetary policy runs effectively.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The relationship between interest rates and inflation is summarized based on the concept *Fisher Effect* for a case study in Indonesia. Testing and synthesis of the two economic variables is carried out using the ARDLmethod *bound testing*. Based on the estimation results, we obtained the main points which are then concluded in this study. First, theValidity is *Fisher Effect* proven from the bound test results. When two related variables namely inflation and nominal interest rates are not indicated to have a positive relationship in the long run, it shows that the *Fisher Effect* does not apply to countries that are used as objects of research. This is in line with research conducted at this time with the object of research in Indonesia. The *Autoregressive Distributed Lag* (ARDL) approach is the type of approach used in this study.

Second, the results of testing the short-term relationship show that Indonesia has no indication of a short-term correlation between interest rates and inflation. When followed by testing to test long-term relationships, *bound testing is* used and then indicates that there is also no long-term relationship between interest rates and inflation

in Indonesia. This means that the theory is *Fisher Effect, considered* invalid in Indonesia in the 2008-2017 research period.

Recommendations

From the aspect of policy, overall control, coordination and policy mix are needed to respond to the phenomena that occur. The policy mix in question is the central bank's policy mix in which the main target is price stability. Instruments of central bank policy used include monetary policy, macroprudential policy, and foreign capital management flows. The findings that show the absence of *Fisher Effect* in Indonesia shows that monetary policy has been running as it should. It's just that, in terms of performance, the government needs to increase its efforts in dealing with price stability / inflation issues given the unstable global economic conditions through other alternatives by not only focusing on the Consumer Price Index (CPI) but also by giving more consideration to asset prices (financial and property).

REFERENCES

BAPPENAS. (2009). *Penguatan ekonomi daerah : Langkah Menghadapi Krisis Keuangan Global*. https://www.bappenas.go.id/files/4413/5027/4149/ ringkasan-eksekutifhandbook-2009060509__20090518105300__0.pdf

Bayoumi, T., Clerc, L., Claessens, S., Hamann, J., Hartmann, P., Jacome, L., Maddaloni, A., Noah, J.-F., Ntsama, N., De Nicolo, G., Stone, M., Tressel, T., & Ratnovski, L. (2010). What Caused the Global Financial Crisis?-Evidence on the Drivers of Financial IMF Working Paper Monetary and Capital Markets Department What Caused the Global Financial Crisis?-Evidence on the Drivers of Financial. *IMF Working Papers*, *WP/10/265*, 64. https://www.imf.org/external/pubs/ft/wp/2010/wp10265.pdf

Benazić, M. (2013). Testing the fisher effect in Croatia: An empirical investigation. *Economic Research-Ekonomska Istrazivanja* , *26*, 83–102. https://doi.org/10.1080/1331677X.2013.11517641

Caporale, G. M., & Gil-Alaña, L. (2019). Testing the Fisher hypothesis in the G-7 countries using I(d) techniques. *International Economics*, *159*(October 2018), 140–150. https://doi.org/10.1016/j.inteco.2019.07.002

Everaert, G. (2014). A panel analysis of the fisher effect with an unobserved I(1) world real interest rate. *Economic Modelling*, *41*, 198–210. https://doi.org/10.1016/j.econmod.2014.05.005

İncekara, A., Demez, S., & Ustaoğlu, M. (2012). Validity of Fisher Effect for Turkish economy: Cointegration Analysis. *Procedia - Social and Behavioral Sciences*, *58*, 396–405. https://doi.org/10.1016/j.sbspro.2012.09.1016

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*, *16*(3), 289–326. https://doi.org/10.1002/jae.616

R., Santos Alimi, Bernad O, M. (2001). Testing an augmented fisher hypothesis for a small open economy: The case of Finland. *Journal of Macroeconomics*, *23*(4), 577–599. https://doi.org/10.1016/S0164-0704(01)00179-3

Yaya, K. (2015). Testing the Long-Run Fisher Effect in Selected African Countries: Evidence from ARDL Bounds Test. *International Journal of Economics and*

Finance, *7*(12), 168. https://doi.org/10.5539/ijef.v7n12p168

Zainal, N., Nassir, A. M., & Yahya, M. H. (2014). Fisher Effect: Evidence From Money Market in Malaysia. *Journal of Social Science Studies*, *1*(2), 112. https://doi.org/10.5296/jsss.v1i2.4915

Determinants of interest free financial products in Ethiopian banking industry

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Abstract

This study is undertaken to identify the determinants of the use and adoption of Interest free financial products in Ethiopian banking industry with specific reference to commercial banks. To achieve the aim of the study the primary data was collected from managers of some selected commercial banks through un-structured interview as well as from customers by using convenience method through standard questionnaires. While, secondary data was collected from documents of banks and Journals to triangulate with response obtained from primary data sources. The collected data was analyzed in descriptive and inferential analysis. The findings depicted as the Economic factors like unemployment and saving habits affecting the adoption of Interest free financial products and services by banks. Further, the obsoleting of technological environment, Inflexibility of government policies, Educational background of the customers and diverse cultures of the societies are the other factors that affecting adoption of financial products. In addition, the Interest free financial products and services are not properly used by the customers as the result of their low level of awareness, the perceived relative advantage, perceived compatibility and perceived complexity and perceived trust of existing banking system. Based on the result it is recommended as the banks should properly adopt the Interest free financial products and services with taking into account of the external factors. Further, the banks should participate on aggressive promotion to aware the customers about their Interest free products and services, the government should formulate policies and regulations that minimizing bureaucracy of adopting technology by banks.

Keywords: *Commercial banks, Ethiopia, Financial product, Interest free*

JEL Classification: G20,O36

INTRODUCTION

The introduction serves two purposes: to stimulate the reader's interest and to outline the reason for the study, that is, the controversy or `knowledge gap' that prompted the study. State the objectives of the work and provide an adequate background. One of the most emerging trends in the global economies is the idea of Interest free banking and Finance (Ahmad, 2000), that emerged in the global landscape as an alternative banking system which is in line with values and ethos of Islam, and governed by the principles of Sharia Law that requires not charge interest and avoid any unethical practices in achieving its goals and objectives (Gait & Worthington, 2008). This form of interest-free banking

has developed over a long period of time in Egypt in 1963 with the introduction of new products in the industry. The role and functions of Islamic banking within the banking system in a modern economy are very important, and in fact, it is at the heart of every robust economy. Hence, Islamic banking is growing at an average rate of 15 per cent a year in size and number, which makes it the fastest-growing sector in the financial markets of the contemporary world (Saidi, 2007; B.S. & Ming-Hua, 2007).

While, the global Islamic banking and finance industry assets worth at over USD1.3 trillion in 2012 and expected to reach USD 2 trillion in next three to five years. The breakthrough in banking industry is occasioned by the introduction and growth of the Interest free banking. However, despite the growth in Islamic banking, there are concerns that development of Islamic banking remains somewhat limited and that the industry may be suffering from a lack of innovation (Khan & Bhatti, 2008b) and lack of initiatives in convincing customers that they are really offering Shariah compliant products and not dressing up conventional banking practices (Karbhari, Naser, & Shahin, 2004).

Despite the growth of Islamic banking worldwide, as the others African countries Ethiopian banking industry was continued to conduct most of their banking transactions using traditional banking system because of lack of supportive regulatory and policy regimes that facilitate the establishment of Islamic financial institutions is the most important worth of mentioning. Since, Muslims believe that banking with the conventional banks is against their religious faith; large numbers of potential Muslim customers are not banking with the existing conventional banks available in the country. To satisfy the community that have problem with the current banking system and to provide alternative banking system the National Bank of Ethiopia (NBE)was expected to approve a directive that paves the way for the establishment of what was called as the first Islamic bank in Ethiopia. A circulated draft form of the NBE‟s directive has allowed Ethiopian nationals to establish a bank exclusively engaged in interest- free banking," however, that hope was short living one as the finally issued draft does not allow the establishment of full-fledged Islamic financial institution.

However, the directive has only opened the door for "existing commercial banks" to create an interest-free banking window alongside of their operations. This Come in to force in October 2011, but interest-free banking in Ethiopia started only in September 2013, when the Oromia International Bank S.C launched the service. The Commercial Bank of Ethiopia joined the market at the end of October, followed by United bank S.C, which began providing the service on May 1, 2014. The introduction of interest-free banking in Ethiopian banking industry is important for being a world class bank, and in addition to provide options for the customers.

For Interest free (Islamic) banking to continue this expansion and succeed in any other setting, it has to be accepted and positively perceived by the potential customers. These makes Customers" intention has become an enduring research topic in banking (Holliday, 1996). Due to higher demand, research should be conducted to check updates on customer's intention and satisfaction of Interest free (Islamic) banking product and services. Additionally, the factors that affecting the banking industry to adopt interest-free banking have been at the forefront of several research works in the developed and some developing world.

Nevertheless, there is very much limited published works that investigate the factors influencing the use of interest-free banking from the viewpoint of customers and banks in the context of developing countries like Ethiopia. To date there have been very few such studies, a remarkable exception to this is the study conducted by (Muhumed, 2012; Sankaramuthukumar & Devamohan, 2008; Kebede, 2015; Shaik Abdul Majeeb, 2014) who studied Islamic banking prospect, opportunities and challenges in Ethiopia, that studied the Role and Progress of Islamic Banking in India, Ethiopia and Rest

of the World, The Potentiality of Islamic banking in Ethiopia and factors that affecting the use of interest free banking Ethiopia.

Moreover, interest-free banking is a new system in Ethiopia which needs a lot of effort and resources to be easily adopted by customers. As the document of some commercial banks in Ethiopia indicated there are financial products and services outdated without even compensated the costs of its adoption. Hence, in order to help banks, improve interest-free financial product and services adoption by their customers, it is necessary to identify factors that influence customers' perceptions toward product and service they provide. Because understanding and adapting to customer motivation and behavior is not an option but an absolute necessity for competitive survival (Owusu-Frimpong,1999)

Accordingly, this study aims to identify determinants of interest-free banking adoption by Ethiopian banking industry and factors that affect the customers to use and levels of customer's satisfaction with existing banks services. Therefore, the purpose of this study is to identify the current status of interest-free banking in Ethiopian banking industry, as well as factors that affecting the adoption, use and satisfaction towards interest-free banking.

RESEARCH HYPOTHESES

Hypotheses related to adoption interest-free financial products and services:

H1: The existing economic situation of the country has significant influence on adoption of interest-free financial products and services in Ethiopian banking industry

H2: Existing Technological change has significant influence on adoption of interest-free financial products and services in Ethiopian banking industry

H3: The country government policies have significant influence on adoption of interest-free financial products and services in Ethiopian banking industry

H4: The societal cultures have significant influence on adoption of interest-free financial products and services in Ethiopian banking industry

Hypotheses related to usage of digital financial products and services:

H5: The position of the banks on customers' awareness have significant influence on using of interest-free financial products and services in Ethiopian banking industry

H6: The customers' perceived relative advantage has significant influence on using of interest-free financial products and services in Ethiopian banking industry

H7: The customers' perceived compatibility has significant influence on using of interest-free financial products and services in Ethiopian banking industry

H8: The customers' perceived complexity has significant influence on using of interest-free financial products and services in Ethiopian banking industry

H9: The customers' perceived trust towards banks has significant influence on using of interest-free financial products and services in Ethiopian banking industry

METHODS

Research design

The purpose of this study is to identify the factors that hinders the use and adoption of interest-free financial products in Ethiopian banking industry through illustrating it from all commercial banks headquarters, a deductive and mixed research approach is well suited. Further, to achieve the objective of the study, the case study method will be applied. Case studies are in which the researcher explores in depth a program, and event, and activity, a process, or one or more individuals (Creswell, 2013).

Target population, sample size and sampling techniques

The target population consists of the managers, Interest free window employees and customers. There are 19 commercial banks are there in Ethiopia all of its headquarters considered for the study. The minimum of 3 Interest free window employees and managers from each headquarters of banks (57) considered as sample. There are large number of customers consisted by those banks hence, according to (Hair & R.E., 2006) a sample size between 200 and 400 is usually acceptable as critical sample size for attitudes studies. Therefore, 11 customers from each commercial bank (209 customers) considered as sample size by using convenience sampling techniques.

Data collection methods

The study the primary data would be collected through un- structured interviews with managers of commercial banks and close-ended structured questionnaire items through the adaptation and modification of instruments from previous studies in the area of adoption studies and usage of innovations with customers and Interest free window employees of the banks. For measuring this information, the Likert scale method was used to range of responses: strongly disagree, disagree, Neutral, Agree, and strongly agree, with a numeric value of 1-5, respectively. Likert-scale is used to ask many people the same questions and examining their answers research questions (Neuman & Kreuger, 2003). So that the researcher would use cross sectional survey in which independent and dependent variables are measured at the same point in time using a single questionnaire (Anol, 2012). The secondary data would be collected by extracting relevant and supportive data and information from the secondary data sources.

Data presentation and analysis

Descriptive analysis would use to achieve the first specific objectives, primary data that were collected through interviews, demographic characterized of respondents and mean of variables. Correlation analysis also used to determine the relationship of variables before regression taken and then multiple linear regression analysis would be used to determine the potential connection between independent variables of this study and the dependent variable of study. Regression analysis was used to identify impacts of variables. Accordingly, these multiple tests would be able to identify potential factors that have a significant impact on adoption and use of financial product and services.

Factor analysis

Factor analysis is a statistical tool/technique which is used to verify the factor structure of a set of observed variables/constructs. It is also used to tests whether a specified set of constructs is influencing responses in a predicted way (Brown, 2015). Factor analysis will allow us to test that there exists a good relationship between observed variables and their underlying latent constructs. So, to evaluate the construct validity of the factors, factor analysis has been performed. The first pre-test has been done by filling & checking the questionnaire by five commercial bank of Ethiopia managers, to improve the questions and replace any confusing & difficult terms. The purpose of first pretest was also to see, if we have overlooked some important dimensions/elements. Factor analysis is used as a pre-test after collecting empirical data through pre-test questionnaires (full version), to test whether there is significant relationship between the factors to measure and choosing the right variable/questions for measuring an underlying factor.

A large sample size has been recommended by different researchers (DeCoster, 1998) to perform Factor Analysis, where the minimum sample size required is 150 (Hair & R.E., 2006). Therefore, a total of 178 responses have been collected for performing the Factor analysis and it done with the help of SPSS 20.0 software, as a second pre-test to verify the conceptualization of the selected constructs/indicators for each factor. After performing Factor Analysis, unimportant and irrelevant questions have been

excluded from the full version questionnaire to get a final version of questionnaire. Results from factor analysis have provided factor loadings for each variable (question) where factor loading above 0.70 and KMO above 0.50 is termed as acceptable so that each factor is explained more by its constructed variable (question) than by, (Voorhees *et al.*, 2016).

Several variables have factor loading above than 0.70 and KMO above 0.50 that prove as best measure of the corresponding factor. Following this, variables/questions with factor loading above 0.70 are kept for final questionnaire.

Validity and reliability

Validity is the degree to which a measure accurately represents what it is supposed to. Cronbach's alpha is used as only one criterion for judging instruments or scales (George & Mallery, 2003). As the current study uses multiple items in all variables, internal consistency analysis was carried out through Cronbach's alpha reliability tests. The results of the reliability analysis, one can conclude that the items are internal consistent. To find the reliability of the empirical data, consistency analysis has been done using SPSS. Consistency analysis is used to find the internal consistency of the observed data, and ranges from 0 to 1.

Although the instruments developed by different researchers to measure the hypothesized factors and consumers' perception, has established good validity and reliability. Among the factors, the factor Level of customers Awareness about financial products and services has the highest ranking of Cronbach's alpha of 0.873, followed by the factor perceived Trust with 0.853. The factor Perceived Complexity has the lowest ranking with 0.705. As well as Government policies about financial products and services has the highest ranking of Cronbach's alpha of 0.931, followed by Economic factors with 0.862. Hence, all variables are retained as the factors are found with good consistency.

RESULTS AND DISCUSSIONS

This section presents the analysis, discussion and inferences made on the basis of the responses obtained. All the data were coded and entered in to SPSS version 20.0 and inferences were made based on the statistical results. The research instrument used in the study was survey questionnaire. The location of the study was Addis Ababa city. The study population comprised the commercial banks' managers, employees and customers with 85% of response rate.

Table 1. Respondents' demographic variables.

Background	Distribution	Frequency	Percentage
Affiliation years	Less than 1 year	44	25
	1-5 years	107	60
	5-10 years	14	8
	Above 10 years	13	7
Reason of associations	Saving	112	63
	Investment	9	5
	Borrowing & sending	28	16
	All	29	16
Educational level	Illiterate	10	6
	Grade 10 complete	17	9
	Diploma	38	21
	Bachelor degree	87	49
	Masters and Above	26	15
Nature of income	Family income	30	17
	Self-employed/merchant	61	34
	Government/NGO	70	39
	Irregular income	17	10

As the Table 1 indicates that Majority of respondents (60%) has been found within the years of 1 to 5 customer of the bank, followed by less than one-year respondents. Which also supported by interview undertaken with respective managers of the banks. Further, the results indicated as most of the respondents are associated with saving account indicating 63%. The managers of commercial banks response indicated as majorly serving customers those associated with saving account. Since there are few customers with investment accounts the deposits accumulation is high that makes money circulation low. The majority of respondents (64%) are Bachelor degree and above holders as well as Government/NGO is their source of income. The interview results indicated as our country majority of population is farmers and low saving habits in the country the account holders are civil servants.

Table 2. Correlation matrix between intention and its predictors

		INT	AW	RELAD	COMP	CLEX	PTR
INT	Pearson Correlation	1					
	Sig. (2-tailed)						
AW	Pearson Correlation	.213**	1				
	Sig. (2-tailed)	.000					
RELAD	Pearson Correlation	.235**	.109*	1			
	Sig. (2-tailed)	.000	.032				
COMP	Pearson Correlation	.282**	-.013	.703**	1		
	Sig. (2-tailed)	.000	.416	.000			
CLEX	Pearson Correlation	-.145	-.129*	-.711**	-.712**	1	
	Sig. (2-tailed)	.023	.014	.000	.000		
PTR	Pearson Correlation	.115*	.039	-.015	.017	-.007	1
	Sig. (2-tailed)	-.025	.252	.403	.384	.454	
	N	178	178	178	178	178	178

***. Correlation is significant at the 0.01 level (2-tailed).*
**. Correlation is significant at the 0.05 level (2-tailed).*

As shown in the correlation matrix Table 2, the correlation coefficient value illustrates as all predictors are has small positive relationship and statistically significant correlation with Intention to use the financial products except complexity and perceived trust. The result shows as all variables correlates best with the outcome and so it is likely that all variables best predict customers' intention to use financial products and services. The result is consistence with the study's findings of (Gerrard & Cunningham, 2003b; Rosly & Bakar, 2003a; Puschel & Hernandez, 2010; Teo & Pok, 2003; Shih & Fang, 2004; Sharofiddin & Bin- Yousoff, 2013) which indicated as there is a positive significant relationship between personal awareness level, relative advantage of the products, customers perceived trust of the products as well as its compatibility and complexity with the customers decision to patronize an Islamic bank product.

Additionally, the majority of interview result indicated the banks in Ethiopia plays a major role in awareness creation in relation to both existing and new financial products launched therefore there is no awareness problem. As well as the majority of interviewee indicated since aggressive awareness creation provided for the end user that the financial products and services is not as such complex. This shows as some of the result of correlation matrix opposed with the interview results.

Regression analysis

The regression analysis was conducted to know by how much the independent variable explains the dependent variable. Before we go to in detail of multiple regression assumption of multivariate normal distribution, independence of errors, and equality of

variance were first tested. This study involves a relatively large sample of 209 customers and all commercial banks headquarters employees 57) and therefore, the Central Limit Theorem could be applied and hence there is no question on normality of the data. Two major methods were utilized in order to determine the presence of multicollinearity among independent variables in this study. These methodologies involved calculation of both a Tolerance test and Variance Inflation Factor (VIF) (Kleinbaum & Klein M, 2002). The results of these analyzes are shows as all predictors VIF is below 10 and none of the Tolerance levels is < or equal to .01. Multicollinearity was not a concern with this data set as confirmed by the main effect regression models.

According to (Field, 2009) the acceptable Durbin – Watson range is between 1.5 and 2.5. In this analysis Durbin – Watson values are ranges from 1.823 to 2.133, which are between the acceptable ranges, show that there was no auto correlation problems in the data used in this research. Thus, the measures selected for assessing independent variables in this study do not reach levels indicate of multicollinearity. Therefore, regression analysis of Predictors and Dependent variables was conducted and the results of the regression analysis are presented as following section.

Adoption of interest free banking

Here it regressed to know the impact of economic situation, technological change, government policies and cultures have on adoption of Interest free financial products and services. It presented as Table 3 and 4.

Table 3. ANOVA and R square

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	56.448	3	18.816	186.297	0.000
Residual	5.353	53	0.101		
Total	61.801	56			
R Square = 0.807		Adjusted R Square = 0.802			
Dependent Variable: ADP; Predictors: (Constant), TECH, LRB, ECO, CUL					

Table 4. Regression model result for beta coefficients

Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**T**	**Sig.**
		B	Std. Error	Beta		
1	(Constant)	-0.624	0.110		-5.671	0.000
	TECH	0.179	0.068	0.140	2.643	0.009
	LRB	0.217	0.073	0.189	2.974	0.003
	ECO	0.678	0.106	0.477	6.368	0.000
	CUL	0.192	0.058	0.181	3.323	0.001

a. Dependent Variable: ADP

The Table 3 shows impacts of technological advancement, government policies and economic factors explain adoption of financial products in commercial banks in Ethiopia by the value of R^2 is .807 and the remining .193 by others variables.

Intention to use

Here it regressed to know the variation of Awareness, Relative advantage; Compatibility, Complexity, and Trust have on Intention to use. It presented as Table 5 and 6.

Table 5. ANOVA and R square

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	54.375	5	10.875	14.179	.000[b]
	Residual	131.924	172	.767		
	Total	186.299	177			
R Square = 0.2304			Adjusted R Square = 0.222			
Dependent Variable: INT; Predictors: (Constant), AW, COMP, PTR, CLEX, RELAD						

Table 6. Regression model result for beta coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.130	.314		3.602	.000
	AW	.254	.060	.244	4.179	.000
	RELAD	.286	.065	.280	4.389	.000
	COMP	.268	.102	.292	2.638	.000
	CLEX	-.286	.065	-.280	4.389	.000
	PTR	-.145	.049	-.227	2.96	.000

a. Dependent Variable: INT

The Table 5 shows of customers Awareness, Perceived Advantage, perceived Compatibility, perceived complexity, and perceived trust on intention indicates as the value of R^2 is .2304, which means that All predictors accounts for 23.04% of the variation in Intention and the value of adjusted R^2 is .222 which is .008 or 0.8% difference from R^2 that indicates if the model were derived from the population rather than a sample it would account for approximately 0.8% less variance in the outcome.

Summary of hypotheses testing

In this study Linear Regression was used to test the research hypotheses. The Table 7 shows the summarized results of the hypotheses tested.

Table 7. Regression coefficients result

Factors	Beta	T-Values	Sig.	Mean	Std. dev	Decision on Hypothesis
AW	+.254	4.179	.000**	2.323	.94819	Failed to reject H1
RELAD	+.286	4.389	.000**	4.821	.34093	Failed to reject H2
COMP	+.268	2.638	.000**	4.799	.42746	Failed to reject H3
CLEX	-.286	4.389	.000**	1.833	.34093	Failed to reject H4
PTR	-.145	2.960	.000**	2.083	.5420	Failed to reject H5
TECH	0.157	3.023	0.003*	3.285	1.1800	Failed to reject H6
LRB	0.217	2.974	0.003*	2.287	1.4613	Failed to reject H7
ECO	0.678	6.368	0.000*	4.292	.62882	Failed to reject H8
CUL	0.253	6.060	0.000*	3.864	.91762	Failed to reject H9

*. Statistically significant at the 0.01 level

The Table 7 presents the p-value (0.000) of all variables are found to have a significant effect on Adoption and customers intention towards using Interest free banking at 1% significance level. Therefore, the all null hypothesis is failed to reject. Specifically, the customers' Awareness of using Interest free banking positively significantly affects the intention of customers towards using it. This is in line with the proposition of Thambiah, etal., 2011b, which is also in line with the findings of (Teo &

Pok, 2003; Sharofiddin & Bin- Yousoff, 2013) that indicate as awareness have a significant impact on the use of banking product and services.

The mean of variable is 2.323 which indicates as customers are not properly know the current service offered by the bank, the product and services are difficult to differentiate from conventional, not better marketing their products and services to the public and not believe as IFB is offered to both Muslim and non-Muslim. Additionally, the interview result suggests as the newness of IFB in Ethiopia will take time for the public to embrace and needs a large awareness creation activity from the bank even if the bank promoting it via TV, Radio, Newspaper, Magazines.

Also, the Perceived relative advantage of using Interest free banking positively affects the intention of customers towards using it. This result is in line with those of (Taylor & Todd, 1995b; Teo & Pok, 2003; Shih & Fang, 2004; Puschel & Hernandez, 2010; Tan & Teo, 2000; To, Liao, Chiang, Shih, & Chang, 2008). Hence, these are the main dimensions that can determine the superiority of either the banks from the customers‟ perspective. The mean of variable is 4.8213 which show that as the respondents perceived that getting products and services via separate windows are proper for activity, they deal with than conventional one and beneficial as financing is based on shares profit or loss made out of it than conventional one.

Similarly, the Perceived compatibility of using Interest free banking positively significantly affects the attitude of customers towards using it. This is in accordance with the findings of (Tan & Teo, 2000; To, Liao, Chiang, Shih, & Chang, 2008; Puschel & Hernandez, 2010). Nevertheless, it contradicts with the findings of (Teo & Pok, 2003; Shih & Fang, 2004). The mean of the variable is 4.7990 which indicate as respondents perceived that the products and services provided via separate windows can fit with their banking needs than conventional as it depends on sharia, and good complementary product that fulfill their belief and ways of life.

In the same way, the complexity of an innovation affects how well customers view it and develops a certain attitude. The result shows as perceived complexity negatively influences the attitude of Customers towards Interest free banking. This is similar to the findings of (Tan & Teo, 2000), while it contradicts with the findings of (Shih & Fang, 2004; Taylor & Todd, 1995b). The mean of the variables is 1.833 which indicates as understanding and using terms and concepts of Interest free banking do not requires a lot of mental effort, and the different name the banks use for these financial products and services from the conventional simple to understand and use. The name Interest free banking communicates and gives enough confidence to the respondents about its usage friendliness, so in turn, most of the respondents indicate as they products is easy to understand and use.

Further, the Perceived Trust of using Interest free banking negatively significantly affects the attitude of customers towards usage of it. This is consistent with (Sharofiddin & Bin- Yousoff, 2013) that conclude as trust have negative significant relationship with the adoption of banking product and services while, contradict with the findings from (Palvia, 2009) which indicates trust has a positive significant effect on customers‟ attitude to use innovation. The mean value of variables is 2.083 which indicate the customers are not clear and trust the bank regarding IFB transaction. In addition the information from those are on managerial position in CBE was explained as they follow NBE directive 51/2011 that enforces to segregate the capital of IFB from the conventional bank, while, Some of frontline staffs of the bank pinpoint that as the IFB amount are not as such proper segregated from conventional bank in cash.

Furthermore, the p-value of Technological advancement, legal and regulatory barriers, Economic factors and societal cultures as the independent variables and Adoption as the dependent variable is 0.000. This means the probability of variation in the dependent variable to occur by chance (not to be affected by the explained independent variables) is 0.000. Therefore, the null hypothesis of 6, 7, 8 and 9 are accepted.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

There are different financial products and services provided and launched by commercial banks in Ethiopia. Interest free banking is the one. Based on the study results from banks adoption of financial products and services perspectives demonstrated as dynamics technology in the business environment affects the banks to adopt Interest free financial products and services, the existing legal and regulatory barriers also prevents banks to adopt, the economic factors like lack of income, irregularity of income, unemployment affect the activity rate of society engaging in any type of financial service that prevents banks to adopt. Furthermore, majority of people keeping their money at home as the result of lack of education, trust and religions that signifying low saving cultures in the country. Furthermore, the study revealed as Interest free financial products and services are not properly used by the customers as the result of less perceived relative advantage of owing it by the customers, low level of customers awareness towards the existence of the financial products and services, the complexity looking of Interest free financial products and services to the customers, considering as using Interest free financial products and services is not compatible for them, less Perceived Trust of the banks.

Recommendations

This study gives hindsight for promoters to aware the prospective hindrance on the existing and newly launched Interest free financial products and services; customer's level of perception of the product, which should subsequently allow them to formulate and develop policies and regulations, to make an adjustment to the existing banking industry in Ethiopia and to establish the necessary strategies to attract individual customers and retain the existing, technology needed must be available and government support on financing structure.

The findings of the current study have significant contributions to the body of knowledge in that the study add value to the banking industry on testing the financial products in banking industry in context of Ethiopia that is lack in the literatures. Furthermore, the study extends and tests the decomposed theory of planned behavior in another context and another area i.e. Interest free financial products and services adoption and usage.

REFERENCES

Ahmad, K. (2000). Islamic finance and banking: the challenge and Prospects. *Review of Islamic Economics,* 9, 57-82.

Anol, B. (2012). So*cial science research: Principles, methods, and practices.* Texbooks Collection 3. Available at: https://scholarcommons.usf.edu/oa_textbooks/3/

B.S., C., & Ming-Hua, L. (2007). Islamic Banking: Interest-Free or Interest based? *Pasific-Basin Finance Journal*, 17(1), 125-144

Brown, T. A. (2015). *Confirmatory factor analysis for applied research*. New York: Guilford publications.

Creswell, J. (2013). *Qualitative inquiry and research design: Five different approaches*. Thousand Oaks, CA: Sage Publishing.

DeCoster, J. (1998). *Overview of Factor Analysis.* Available at: . http://www.stat-help.com/notes.html

Field, A. (2009). *Discovering Statistics Using SPSS*. Thousand Oaks, CA: Sage Publishing

Gait, A. &. (2008). An empirical survey of individual consumer, business firm and financial institution attitudes towards Islamic methods of finance. *International Journal of Social Economics, 35*(11), 783-808.

Gait, A., & Worthington, A. (2008). An empirical survey of individual consumer, business firm and financial institution attitudes towards Islamic methods of finance. *International Journal of Social Economics, 35*(11), 783-808.

George, D., & Mallery, P. (2003). *SPSS for Windows step by step: A simple guide and reference. 11.0.* Available at: https://wps.ablongman.com/wps/media/objects/385/394732/george4answers.pdf

Gerrard, P., & Cunningham, J. (2003b). The diffusion of internet banking among Singapore consumers. *International Journal of Bank Marketing, 21*(1), 16-28.

Hair, J. B., & R.E., A. (2006). *Multivariate Data Analysis: A Global Perspective . (7, Ed*.) Pearson Education Inc.

Holliday, K. (1996). Keeping close to the customer. *International Journal of Bank Marketing, 28*, 14-19.

Karbhari, Y., Naser, K., & Shahin, Z. (2004). Problems and Challenges Facing the Islamic Banking system in the west: the case of UK. *Thunderbird International Business Review, 46*(5), 521-543.

Kebede, D. A. (2015). *Factors Affecting Customers to Use Interest Free Banking in Ethiopia*. (Unpublished project work).

Khan, M., & Bhatti, M. (2008b). Islamic banking and finance: on its way to globalization. *Managerial finance, 34*(10), 708-725.

Kleinbaum, D., & Klein M. (2002). *Logistic Regressions: A self-learning text*. Berlin Springer.

Muhumed, M. (2012). *Islamic Banking: Prospects, Opportunities and Challenges in Ethiopia* (unpublished project paper).

Neuman, W. L., & Kreuger, L. (2003). *Social work research methods: Qualitative and quantitative approaches.* Boston: Allyn and Bacon.

Owusu-Frimpong, N. (199). Patronage behavior of Ghanaian bank customers. *International Journal of Bank Marketing, 17*(7), 335-341.

Palvia, P. (2009). The role of trust in e-commerce relational exchange: A unified model. *Information & Management, 46*(4), 213-220.

Puschel, J. M., & Hernandez, J. M. (2010). Mobile banking: proposition of an integrated adoption intention framework. *International Journal of Bank Marketing, 28,* 389-409.

Rosly, S., & Bakar, M. (2003a). Performance of Islamic and mainstream banks in Malaysia. *International Journal of Social Economics, 30*(12), 1249-1265.

Saidi, A. (2007). Relationships between ethical and Islamic banking systems and its business management implications,. *South Africa Journal of Business Management, 1,* 43-49.

Sankaramuthukumar, S., & Devamohan, A. (2008). *The potentiality of Islamic banking in Ethiopia*, a research paper to be presented at the sixth international conference on the Ethiopian economy.

Shaik Abdul Majeeb, P. (2014). Role and Progress of Islamic Banking in India, Ethiopia and Rest of the World - An Analysis. *European Journal of Business and Management, 6*(17).

Sharofiddin, A., & Bin- Yousoff, W. S. (2013). *The challenges of conventional banking practice and prospects of introducing an Islamic bank to Tajikistan*. 9th International Conference on Islamic Economics and Finance: Growth, Equity and Stability. An Islamic Perspective.

Shih, Y., & Fang, K. (2004). The use of a decomposed theory of planned behavior to study Internet banking in Taiwan. *Internet Research, 14*(3), 213-223.

Tan, M., & Teo, T. (2000). Factors influencing the adoption of Internet banking. *Journal of the Association for Information Sciences, 1*, 1-42.

Taylor, S., & Todd, P. (1995b). Decomposition and crossover effects in the theory of planned behavior: A study of consumer adoption intentions. *International Journal of Research in Marketing, 12*, 137-155.

Teo, T., & Pok, S. (2003). Adoption of WAP- enabled mobile phones among Internet users. *Omega - The International Journal of Management Science*, 31(6), 483-498.

Thambiah, S., Eze, U. C., Santhapparaj, A. J., & Arumugam, K. (2011b). Customers‟ Perception on Islamic Retail Banking: A Comparative Analysis between the Urban and Rural Regions of Malaysia. *International Journal of Business and Management, 6*(1), 187- 198.

To, P., Liao, C., Chiang, C., Shih, M., & Chang, C. (2008). An empirical investigation of the factors affecting the adoption of instant messaging in organizations. *Computer Standards and Interfaces, 30*, 148-156.

Determinants of banks' cost efficiency: a case study of selected commercial banks, Ethiopia

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Abstract

This study examines the determinants of cost efficiency commercial banks' in Ethiopian using balanced panel data with a sample of 13 commercial banks over the period 2010-2017 by paying a translog stochastic cost frontier approach. The identification and selection of inputs and outputs variables was based on the intermediation approach. Accordingly, three input variables (cost of labor, cost of capital, and cost of fund) and two output variables (total loans and other earning assets) are used in the study. Furthermore, five banks specific and one macroeconomic variable are included to examine their effect on cost efficiency. So as to examine the effect of determinant variables which are associated with banks efficiency, a single stage maximum likelihood estimation method is applied to stochastic frontier cost function. The empirical estimations were accomplished by Appling a single stage maximum likelihood function assimilated into Stata software. The estimation is based on conditional mean model concepts. The finding shows that from bank specific factors, return on assets (ROA), and intermediation ratio have positive and significant for intermediation (IR) and insignificant for ROA with cost inefficiency. On the other hand, Bank size (lnTA), Credit risk (CR) and capital adequacy ratio (CAR) have a significant negative coefficient with cost inefficiency. GDP also has negative but insignificant with inefficiency. Therefore, banks are recommended to improve and sustain their efficiency by maintaining available proportion of capital adequacy ratio and attract high value, low interest-bearing demand deposits.

Key Words: *Bank, Cost efficiency, Stochastic cost frontier*

JEL Classification: G21, G32, G33, O16

INTRODUCTION

Modern Banking in Ethiopia was started in 1905, for the period of Minelik II, with the establishment of the Bank of Abyssinia (Rama & Tekeste, 2012). The bank of Abyssinia was owned by the Ethiopian government in partnership with the National Bank of Egypt formerly under British rule. However, a sound banking system started to develop in the early of 1940s-after the Italian departure. A government preserved bank which is the State Bank of Ethiopia-was established in 1942, and a number of foreign bank branches and a private bank were working in opposition with the government possessed commercial bank up to they were nationalized and merged into one government owned

mono-bank in 1976. Due to their dynamic role, banks as financial intermediaries play unlimited role in the economy of a country being as a major resource allocator of a state. Moreover, financial institutions help the government in formulating and evaluating monetary and economic policies, and also make accessible a wide diversity of economic services such as transfer of money, foreign exchange, simplify international trade, market stabilization and other related activities (Scott & Timothy, 2006).

Commercial banks collect deposits from depositors and use the proceeds to provide credit to businesses, individuals, as well as government agencies. Hence, they support investors who demand to invest their surplus funds in the form of deposits. Commercial banks use the deposited moneys to bid commercial loans to businesses and personal loans to individuals. Correspondingly, commercial banks make invest in debt securities issued by firms as well as government agencies. As banks are financial intermediaries, they should have to do in economically or efficiently so as to facilitate economic development of a country through of transfer of economic resources Efficiency is a crucial notion for financial institutions, and it is measured in respect to an organization's objective and goals. It can be measured regarding maximization of output, maximization of profits, or minimization of costs (Mester & Allen, 2003). The efficiency of commercial banks is usually measured in terms of minimization of inputs to produce a specific level of outputs or in terms of maximization of outputs given a specific level of inputs (Wang, 2008).

Banks are the primary sources of external funds for businesses throughout the world. So the data suggests that banks have the most important role in financing business activities in both industrialized and under developing countries. Although banks are even more important in developed countries, they play the more important role in the financial system of under industrialized countries (Frederic, 2004). Therefore, commercial banks are the primary financial intermediaries in Ethiopia as Ethiopia is one of the developing sub-Sahara African countries. They constitute a significant part of the financial sector. According to (Beck, 2006), global financial background has been changing rapidly in the last two decades as a result of regulatory changes and technological development. Therefore, in a dynamic and reasonable banking system, only strong, technically efficient and profitable banks can promise a realistic return to their stakeholders and reduce the probability of bankruptcy (Adusei, 2016).

There are numerous studies which considered the determinants of the banking sector by using both parametric and non-parametric approaches in different parts of the world. For example, Tecles & Tabak (2010) studied the determinants of bank efficiency in Brazil by using stochastic frontier analysis. Fries & Taci (2005), studied the efficiency of banks across 15 East European countries.

Regarding to Ethiopian commercial banks, Muluneh (2006), examined the cost efficiency of six privately owned banks through a stochastic frontier analysis using quarterly data covering the year 1994-2001. Similarly, Eskindir (2013), applied the stochastic frontier approach so as to examine the cost efficiency of 10 commercial banks during the period 2007-2012 and to determine whether ownership has an impact on the cost efficiency of banks and found that private commercial banks are more cost efficient than the state-owned banks.) Tesfay (2016) examined the determinants of commercial Banks efficiency in Ethiopia over the period 2003–2012 using Tobit model. The study results revealed that deposit liquidity is found to have positive and significant effect on bank efficiency, while bank size has negative and significant effect on bank efficiency.

Mohana & Tekeste (2012), examined the relationship between cost efficiency and ownership structure of commercial banks in Ethiopia using data envelopment analysis (DEA). Moreover, they made try to discover the key causes that affect the cost efficiency

of the commercial banks using the Tobit model. Emishaw (2016), analyzed the determinants of Ethiopian commercial banks' cost efficiency using unbalanced sample of 12 commercial banks over the period 2000-2013 by employing a translog stochastic cost frontier approach. In order to examine bank specific factors which, influence in (efficiency), a single stage maximum likelihood estimation procedure is applied to a stochastic cost frontier function.

However, the aforementioned studies listed differently for the factors of commercial banks in Ethiopia that are contributed for different efficiency score over different time. Therefore, it is vital to study the determinant factors behind over time. Most of the studies are focused on technical as well as allocative efficiency only. Moreover, they have focused on non-parametric approaches that preset the inefficiency components differently than parametric approaches. Thus, this study includes the current data which enables the researcher to examine the current actual situations and efficiency performance of commercial banks. Furthermore, it includes bank specific determinant variables as well as macroeconomic factor that are affecting efficiency of banks positively or negatively.

Henceforth, assessing the determinants of commercial banks' efficiency is a vital owner so as to check benchmarks of their business, for depositors to make decisions about their savings, and it is essential for government to assess a particular sector of the economy. Therefore, this study was conducted with the objective of examining determinants of cost efficiency of commercial banks as well as the factors that are associated with cost efficiency of commercial banks using stochastic frontier approach to analysis the relative cost efficiency of commercial banks in Ethiopia based on an intermediation approach. The study used recent data from published and audited annual financial reports of commercial banks in Ethiopia during the period of 2010-2017 G.C.

METHODS

Target population

The target populations of this study were all of commercial banks of Ethiopia both the private and state-owned banks which are on operating for the described time periods.

Data types and sources

For this study we used panel data sourced from secondary sources so as to achieve the stated objectives. To do so, bank specific data which are audited financial statements (i.e. Balance Sheet and Profit & Loss Accounts) of each selected commercial bank included in the sample and macroeconomic data were collected from National Bank of Ethiopia. The collected data covers the time period from year 2010 to 2017 (for eight years data).

Sampling design and size

Non-probability sampling technique is applied in this study. Because, since the data used for this study includes the period of 2010-2017, some banks which are established after 2010 and have no data for the required period of time. Therefore, the sample of the study was based on judgmental sampling technique and incorporated thirteen commercial banks. The sample banks were awash international bank, Dashen bank, Bank of Abyssinia, Wogagen bank, united bank, Nib international bank, Cooperative bank of Oromia, Lion international bank, Zemen bank Sc, Oromia international bank, Bunna bank Sc, Berhan international bank Sc, and Commercial bank of Ethiopia. All these sample banks are on working since prior to 2010 G.C and they have the required data for this study.

Method of data analysis and presentation

To test the proposed hypotheses, statistical analyses were carried out using econometric analysis which is Stochastic Cost Frontier Model was used to test the relationships among variables

Description and operational definition of variables

Dependent variable

According to Fries & Taci (2004), Cost efficiency is determined by how close a banks costs lie to the efficient cost frontier for a given technology. The efficient frontier is determined by both technical efficiency and a locative efficiency. The absence of either technical or allocative efficiency or both necessarily leads to a departure from cost minimization and creates inefficiency. As the dependent variables represent the output or outcome whose variation is being studied, the dependent variable in this study is cost efficiency of commercial banks in Ethiopia.

Independent Variable

The independent variables represent inputs or causes, that is, potential reasons for variation. In this study, the independent variables include the input variables which are price of labor (W1), price of deposit (W2), and price of capital (W3), the output variables include total outstanding loans (Y1), deposits in NBE and other banks plus total investments in securities and other investment opportunities (Y2). In addition to the input and output variables, six banks specific and one macroeconomics determinant variables are also incorporated in the study.

Stochastic cost frontier model specification

This study intended to use the stochastic frontier approach. According to Battese and Coelli, (1995) stochastic frontier approach estimates a border function by taking into account the distributional assumptions for both components of random error and inefficiencies. The stochastic frontier approach assumes that bank inefficiency components have a truncated normal distribution which is independently and identically distributed across different banks, an assumption which is violated in the second step of the estimation procedure. This procedure permits cost efficiencies and their determinants to be estimated using a one-step maximum likelihood estimates (MLE) procedure (Fries &Taci, 2004).

According to Shen & Jones (2008), cost efficiency provides a measure of how close a bank's actual cost is to what a best practice institution's cost would be for producing the same output bundles under the same conditions. The measure is derived from a cost function in which total cost depends on the prices of inputs (W), the output quantities (Y), bank specific variables (Z) and an error term (ε). Thus the general form for the stochastic cost frontier function specified as follows:

$$C_it = f(W_it, Y_it, Z_it; +\beta) + \mathcal{E}_{it} \quad (1)$$

Where C measures the total cost, W is a vector of the input prices, Y is a vector of the output quantities, Z is a bank specific efficiency determinants, β’s are parameters and to be estimated, ε is preserved as a composite error term which is given in the form of $\varepsilon_{it} = \mu_{it}+v_{it}$, v_{it} symbolize the random component or error term which follows a normal symmetric distribution around the border, N (0, $\sigma 2_v$) and integrates measurement error and break that could consequences for high or low costs for banks. The other component, μ_{it}, arrests the inefficiency term which follows a truncated normal asymmetric distribution or a half-normal distribution. Additionally, μ_{it} and v_{it} are should be independently and identically distributed. Therefore, the inefficiency component, (μ_{it}) is assumed to be the

function of a set of bank specific variables (Z_{it}) that may affect performance, a vector of coefficients to be estimated (∂) and random error (W_{it}).

$$\mu_{it} = Z_{it}\,\partial + W_{it} \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots . (2)$$

Where, the random variable W_{it} has a half normal distribution with zero mean and variance $\sigma\mu^2$. To make things easier the measurement of efficiency, a functional form has to be chosen given the multiplicity of bank functions. Thus, to estimate the cost frontier function the trans-logarithmic functional form is looks to be best adapted compared to other functional forms because it takes into account the various complementarities between explanatory variables and it does not impose any restriction on the functional form. Moreover, panel data is used because observing banks at several points in time allows for possibly better estimates. For instance, assumptions relating to the stochastic frontier analysis can be relaxed, allowing for more flexibility in the handling of the model. Consequently, according to Kumbhakar & Lovell (2000) the estimation of banks relative efficiency using panel data is obtained by estimating a translog cost function of the general form as follows:

$$\ln C_{it} = \ln C_{it}(Y_{it}, W_{it}, Z_{it}; \beta) + \mathcal{E}it \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (3)$$

Where $\varepsilon_{it} = v_{it} + \mu_{it}$ for every bank i = 1,.., N; C_{it} is total cost of bank i, Y_{it} is outputs' vector of bank i, W_{it} is inputs' vector of bank i, Z_{it} is bank specific variables, β is vectors of parameters to be estimated, μ_{it} is the measure of inefficiency of bank i and is determined by a set of bank specific variables. Staikouras & Schmiedel (2007), estimate the specific cost efficiency frontier using the specification of Tran slog as follows:

$$\begin{aligned} \ln C_{it} = a_0 + \sum_j \alpha jl\, n W_{\mathbf{j}it} + \sum_k \boldsymbol{\beta} k \ln Yk_{it} + 0.5 \sum_h \sum_j \alpha hj \ln Wh_{it} \ln Wj_{it} \\ + 0.5 \sum_k \sum_1 \beta k1 \ln Yk_{it} \ln Y1_{it} + \sum_h \sum_k \delta hk\, lnWh_{it} lnYk_{it} \\ + \sum_m \varphi m ln Z m_{it} + V_{it} + \mu_{it} \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (4) \end{aligned}$$

Where i = (1,…….,13) refers to number of banks ,t = years of study (2010-2017), h and j= (1,….,3) are parameters of input prices, k and l = (1,2) are outputs, m refers to number of bank specific variables; β, δ and φ are parameters to be estimated. To decrease the number of parameters and consequently, to win in terms of degrees of freedom, the following limitations must be imposed:

$$\alpha hj = \alpha jh \text{and } \beta k1 = \beta 1k \ldots \ldots \ldots \ldots \ldots \ldots \ldots .. (Symmetric \quad constraints)$$

Furthermore, any function of cost must be homogeneous of degree 1 in input prices. So, a proportional increase in input prices increases the total cost in the same proportion without affecting the factors request. The linear homogeneity conditions were imposed during the estimation by normalizing the cost and inputs prices by the input price of capital. This condition of homogeneity is translated by the following limitations:

$$\sum_j \alpha j = 1; \sum_j \alpha hj = 0; \sum_j \delta hk = 0 \ldots \ldots \ldots \ldots \ldots (Homogeniety \;\; constraints)$$

These constraints of symmetry and homogeneity reduce significantly the number of parameters to be estimated.

RESULTS AND DISCUSSION

Estimation results of the stochastic cost frontier analysis

The empirical result of the cost frontier estimation throughout in this paper is accomplished by maximum likelihood cost function incorporated into Stata 14.0. Supplementary assumptions about the distribution of the one-sided error term were also tried. Specially, a more restrictive half-normal distribution of the inefficiency effect (Bottasso & Sembenelli, 2004) was estimated. Therefore, the result of this estimation is not reported. In contrast, convergence of the single stage frontier estimation and cost inefficiency model assuming a truncated normal distribution is achieved only after 14 numbers of iterations. Accordingly, the reported results are based on the selected specification taking into account the assumptions made about the inefficiency error component. In this manner, a general unrestrictive truncated normal distribution is assumed. According to Fujii (2001), the main advantage of this truncated normal distribution is that it allows for a simultaneous estimation of the stochastic frontier function and analysis of the determinants of the inefficiency effects under very general conditions.

Since, the conditional mean model approach allows for single step estimation of maximum likelihood estimates (MLE) of the parameters of the stochastic cost frontier function and the inefficiency model, the estimation result of the translog function is based on the conditional mean model approach of SFA method, using Strata software. In this paper, all the summary statistics and regression reports are generated using the software STATA.

The Table 1 presents the empirical results of the stochastic cost frontier model found through using Maximum Likelihood Estimation (MLE) method.

Table 1. Empirical results of the stochastic cost frontier model

Variables	Coefficients	Std. Erors	p-value
Lnw1	0.3071 *	0.0522	0.000
Lnw2	0.1522 *	0.0335	0.000
Lnw3	-0.00896	0.0243	0.713
Lny1	0.9124 *	0.0287	0.000
Lny2	0.0383	0.0294	0.193
Constant	0.0837	0.2533	0.741
Mu	-0.27077	17.2605	0.997
lnsigma2	-4.0127 *	1.0150	0.000
ilgtgamma	-4.0885	61.4261	0.947

*Log likelihood function= 61.946926 and the notations *represents the level of significant at 1%.*

As indicated from the regression table above, the input prices for labor and price of capital is positive and significant. This implies that increases in banks labor costs and other operating costs are directly reflected in higher total operating cost of the banks. As regression coefficient indicates, the unit labor cost coefficient is higher than that of the unit cost of capital. This implies that the amount of expenditure used as a labor wages, salaries and other benefits has a significant effect on total cost than that of expenditures relating to unit cost of capitals. When other things being constant and the unit labor cost increase by 1%, total operating expenditure of banks leads to increase by 0.307. This implies that from total expenditure of commercial banks, personnel or labor cost consists about 30.7%. Similarly, keeping other things constant and the price of capital increases by 1%, it leads to increase in total operating cost by 15.2%. In fact, both labor cost and cost of capital contribute the largest portion of banks operation expenses. This result is similar as expected value before regression.

The result also shows that the price of deposits is statistically insignificant with a negative sign. This implies that the contribution of cost of deposit has not high effect over total operating costs. Furthermore, this negative indicates the effect of interest rate margin over the cost of deposits. The presence of interest rate margins consequently may contributes to increase the levels of efficiency. This negative and insignificant sign of price of fund is deferent from the finding of Emishaw (2016) with positive and significant sign of cost of deposits.

The coefficients of both loans and other earning assets (out puts) are positive but significant for the first one and insignificant for the second one. The positive and significant sign of loans implying that production of loans followed with higher transaction costs because of the possibility related to risk assessment of loan applicants and checking of repayments. The higher estimated coefficient loans than that of the coefficient of other earning assets implies that in Ethiopian banks focus to invest on short term, medium term, and long-term loans as revenue generating activities. It is also indicating that Ethiopian banks are main sources of funds for business, individuals, as well as investors. This result is consistence with finding of Musonda (2008) when he was investigated the determinants of cost efficiency in Zambian banking sector. However, it is different from the finding of Emishaw (2016) when he examined the determinants of cost efficiency of banks in Ethiopian. The proportion or percentage of cost of output (loan) is higher and about 0.912. This means that the largest portion of labor cost is related to loan assessment and related activities. Furthermore, since banks are financial intermediaries, they collect time deposit, demand deposits and fixed deposits from customers and convert these deposits in to loans by incurring additional cost of customer analysis. Therefore, the cost of customers' analysis and cost of default loans increases the total cost of operations in banks. Consequently, this may lead to cost inefficiency of banks.

The positive but insignificant sign for other earning assets implying that, since these assets include investments on government and other corporate securities, deposits in national bank, and other banks, as well as deposit in foreign banks, these out puts(investments) are performed with low transaction costs. This result is inconsistent with the finding of (Emishaw, 2016).

Determinants of banks cost efficiency

Since the purpose of this study is to investigate the determinants of cost efficiency of commercial banks in Ethiopia. The researcher has more emphasized on bank specific and macroeconomic factors that are affecting cost efficiency level of commercial banks. Therefore, the estimated outcomes regarding to the determinants of bank cost efficiency are performed based on the conditional mean model approach of SFA method. Because, conditional mean model allows the single step estimation of maximum likelihood estimates (MLE) of the parameters of the stochastic cost frontier function and the inefficiency variables. The empirical results have presented in the Table 2.

As the regression coefficient indicates from the Table 2, Bank size (lnTA) which is the natural logarithms of total assets has a negative and significant coefficient. This negative and significant sign implies that there is appositive relationship between this variable and cost efficiency, but negatively related with cost inefficiency. Since large banks have capable of mobilizing large amount of funds in the economy, they can generate high returns for depositors as well as the equity holders. Therefore, larger banks have cost advantages over other smaller counterparts. Furthermore, larger banks could be able to finance large volume of profitable investment prospects and acquire better access to investment activities. This negative and significant relationship between bank size and

inefficiency model implies that large size enables banks to have economies of scope and consequently leads to cost efficiency.

Table 2. Empirical results of the determinants of banks cost efficiency

Variables	**Parameters**	**Coefficients**	**Std. Errors**
lnTA	β_1	-0.5839**	0.1068352
CAR	β_2	-0.1396**	0.0212513
CR	β_3	-0.1489**	0.0264674
IR	β_4	0.1205**	0.115208
ROA	β_5	0.0578**	0. 0585492
GDPGR	β_6	-0.03091	0.0622785
Constant	α_0	14.51369	3.359176
lnsigma^2		-0.6762146	0.1386752
Ligtgamma		-1.905811	6.049789
Sigma		0.50853	0.0705217
Gamma(γ)		0.129452	0.6817768
Sigma_u^2		0.065831	0.3467807
Sigma_v^2		0.442707	0.3524286

*The symbolizations ***,**,* shows the level of significance at 1%, 5%, and 10% respectivily.*

The presence of Economies of scope also enables banks to enjoy operational efficiencies, it is driven by product or services diversification. In the banking sector, economies of scope could be economical to diversify into different areas of financial services such as investment banking, commercial banking, leasing, and life insurance rather than focusing on traditional commercial banking only. This result is similar with of (Rohana & Tekeste, 2012). They found that bank size has appositive relationship with cost efficiency. But, it is different from the finding of Sanderson and Prier (2016) when they were investigated Zimbabwean banks sector. It is also similar with the conventional economics efficiency theory and findings of previous researchers (such as Rozzani & Rahman, 2013) it is hypothesized that larger banks would acquire better efficiency, since these banks would have more resources to be allocated for better services to its customers).

The capital adequacy ratio (CAR), with negative and significant coefficient also shows that, there is a negative relationship between inefficiency and this variable and implies that positively related with cost efficiency. High level of capital reduces the risk of insolvency and the cost of borrowed capital. Since car is measured by the ratio of bank's capital over total assets, it is an indicator of the coverage ratio of banks assets by owners' fund. Furthermore, it is as a measure of bank's financial strength and stability. Since then, the positive and significant coefficient of CAR with cost efficiency implies that well capitalized banks can provide better banking products and services in stabilized manner. Furthermore, higher amount of capital enables banks to invest without raising additional deposits as source of funds with cost of funds (interests). This situation enables banks to reduce cost of funds relating to raising additional deposits to finance their activities. This outcome is consistent with the finding of Frimpong, Gan & Hu (2014) that evaluate cost efficiency Gana's banking sector and found that appositive relationship between CAR and efficiency. Whereas, it is different from the finding of Emishaw (2016) found appositive and significant relationship between this variables and total costs and contributes to lower cost efficiency and Sanderson & Pierre (2016) evaluated the cost and revenue efficiency of the Zimbabwean banking sector during the period of 2009- 2014. The result showed that capital adequacy has a negative and significant relationship with cost efficiency.

The intermediation ratio (IR) has a positive and significant coefficient with cost inefficiency. This implies that negatively affects cost efficiency of commercial banks. The positive and significant coefficient indicates that an increase in the proportion of interest-bearing deposits (time and savings deposits and interbank liabilities) to gross loans, the higher the intermediation costs and by extension, the higher the operating expenses. In order to decrease the costs associated with deposit mobilization and interbank funds, banks should be encouraged to attract high value, low interest-bearing demand deposits. Furthermore, the positive coefficient indicates that the major sources of funds for commercial banks of Ethiopia are from interest bearing customer deposits rather than equity capitals. Therefore, the cost of funds (interest expense) positively affects total operating costs and then negatively affect cost efficiency of banks. This result is similar with the finding of Joshua (2011) stated that intermediation ratio has positive relation with total cost and negatively related with cost efficiency. However, it is not similar with the finding of Nitoi & Spulbar (2015) when they evaluate cost efficiency of central and Eastern Europe by using heteroskedastic frontier model (Pancurova & Lyocsa,2013).

The profitability indicator variable ROA has a positive and insignificant coefficient with cost inefficiency. This implying that it affects negatively but insignificantly cost efficiency of commercial banks. The negative coefficient indicates that when ROA of banks increase by 1% the total cost of banks as can increase by 0.21% and then leads to increase cost inefficiency of banks. Furthermore, the positive sign of ROA with cost inefficiency shows that banks finance their business activities through customer's interest-bearing time and saving deposit. This cost of funds can positively affect the amount of total operation costs of banks and while cost efficiency of banks. This result is conformity with the result of Sanderson & Pierre (2016) when they have evaluated the cost and revenue efficiency of the Zimbabwean banking sector and found that cost efficiency is negatively related with ROA. However, the result is not conformity with the finding of Emishaw (2016) and Mohana & Tekeste (2012), who were evaluated cost efficiency of commercial banks in Ethiopia.

Credit risk (CR), with negative and significant coefficient indicates the indirect relation between this variable and cost inefficiency but has a direct relationship with cost efficiency. The negative and significant sign implies that on average 1% increase in the proportion of total loan to total assets leads to increase cost efficiency of banks while decrease cost inefficiency of by 0.137. This result is similar with the finding of Niţoi & Spulbar (2015), when they have investigated the commercial banks cost efficiency differences in six emerging countries from Central and Eastern Europe. They found that the ratio of loans in total assets and an increased lending-focused activity of the banks lead to a higher efficiency for the banks. Furthermore, Sufiana (2008), also found similar result stating that the proportion of total loan to total asset, has positive and statistically significance with efficiency.

Gross Domestic Product (GDP), with negative but insignificant coefficient indicates that there is inverse relationship between GDP and cost inefficiency but has direct relation with cost efficiency. This is similar with finding of Phan, Anwar, & Alexander (2014). They found positive and significant with the variable GDP when they had assessed cost efficiency of Hong Kong banking sector. Impact of this variable on total cost inefficiency is low. It is different from the finding of Phan, Anwar, & Alexander (2014). They found positive and significant with the variable GDP when they had assessed cost efficiency of Hong Kong banking sector. Tesfaye (2014), finds that the real GDP growth rate which measures the economy growth of Ethiopia has not impacted significantly on the performance of commercial banks.

Analysis of average bank level efficiency scores

Table 3. presents the average cost efficiency scores and their ranks of each banks estimated from the translog frontier cost function. As estimation shows, the banking sector as a whole, operated with a mean cost efficiency of 0.998. Accordingly, the mean inefficiency of commercial banks in Ethiopia is about 0.002% on average. This implies that commercial banks in Ethiopia could improve their efficiency performance by saving up to 0.002% in their expenditures per year when they were all utilizing the best practice technology over the sample period.

Table 3. Average levels of cost efficiency and ranks of banks

Bank	Mean efficiency	Std. deviation	Rank
CBE	0.9989134	8.70e-06	4
AIB	0.9989065	3.80e-06	8
DB	0.9989086	4.89e-06	7
BOA	0.9989042	7.54e-06	11
WB	0.9989093	7.40e-06	6
UB	0.9988998	7.76e-06	13
NIB	0.9989003	6.17e-06	12
CBO	0.9989166	8.18e-06	3
LIB	0.9989096	7.42e-06	5
OIB	0.9989181	5.01e-06	1
BuIB	0.9989062	5.71e-06	9
BRIB	0.9989051	7.0e-06	10
ZB	0.9989174	0.0001	2

The estimated cost efficiency of individual bank shows the relative average cost efficiency of each bank from the relative best performance common frontier. As the estimated coefficient of each bank shows, all commercial banks of Ethiopia have relatively the same cost efficiency performance relative to common frontier. This implies that the effect of technology and working environment have the same impact over all commercial banks in Ethiopia. Moreover, the relative similarity performance of each bank indicates that commercial banks in Ethiopia follow the same strategies, use the same technology and there is sharing of technology and experience. It also indicates that no one has competitive advantage in terms of technology, in terms of labor specialization as well as in the working environment over the others. Correspondingly, the effort or straggle of each bank for cot minimization enables them to have relatively the same efficiency performance regardless of size and capital.

CONCLUSIONS AND RECOMMENDATION

Conclusions

The estimation of the parameters was performed based on Maximum likelihood cost function frontier model. With respect to the determinant variables, the estimation of the parameters was performed based on maximum likelihood cost function frontier model by assuming conditional mean model.

This study has found the area of bank efficiency, at which commercial banks can improve their cost efficiency. This area of efficiency was identified by estimating the coefficients of each variable included in the regression model. The input and output variables incorporated in the regression were selected based on the intermediation approach. Based on maximum likelihood cost function frontier model and conditional mean model assumption, on average commercial banks in Ethiopia have performed efficiently almost around the best common efficiency frontier. As the estimated result

shows, all banks which have included in the selected sample have relatively the same efficiency levels. Furthermore, results show that there is no one which has a competitive advantage in terms of technology, interns of working environment, or in terms of skilled man powers.

Since the cost of labor and cost of capital covers a large proportion of banks operation costs, the effort of each banks to minimize their operational expenses enables banks to have relatively similar cost performance regardless of size and capital.

Regarding to the determinants of cost efficiency, bank size (lnTA) which is the natural logarithms of total assets has a negative and significant coefficient with cost inefficiency. This negative and significant sign with inefficiency model implies that there is appositive relationship between this variable and cost efficiency. In other words, there is appositive and significant relationship between the variable bank size and cost efficiency but there is negative relationship between bank size and cost inefficiency. Since large banks have capable of mobilizing large amount of funds in the economy, they can generate high returns for depositors as well as the equity holders. Therefore, larger banks have cost advantages over other smaller counterparts with respect to their size.

The capital adequacy ratio (CAR), with negative and significant coefficient also shows that, there is a negative relationship between inefficiency and this variable and implies that positively related with cost efficiency. Furthermore, it is as a measure of bank's financial strength and stability. Since then, the positive and significant coefficient of CAR with cost efficiency implies that well capitalized banks can provide better banking products and services in stabilized manner. Furthermore, higher amount of capital enables banks to invest without raising additional deposits as source of funds with cost of funds (interests).

Credit risk (CR), which is the measure of total Laos to total assets with negative and significant coefficient indicates the indirect relation between this variable and cost inefficiency but has a direct relationship with cost efficiency. The negative and significant sign implies that on average 1% increase in the proportion of total loan to total assets leads to increase cost efficiency of banks while decrease cost inefficiency of by 0.137. The intermediation ratio (IR) has a positive and significant coefficient with cost inefficiency. This implies that negatively affects cost efficiency of commercial banks. The positive and significant coefficient indicates that an increase in the proportion of interest-bearing deposits (time and savings deposits and interbank liabilities) to gross loans, the higher the intermediation costs and by extension, the higher the operating expenses. Furthermore, the positive coefficient indicates that the major sources of funds for commercial banks of Ethiopia are from interest bearing customer deposits rather than equity capitals. Therefore, the cost of funds (interest expense) positively affects total operating costs and then negatively affect cost efficiency of banks. The profitability indicator variable ROA has a positive and insignificant coefficient with cost inefficiency. This implying that it affects negatively but insignificantly cost efficiency of commercial banks. The positive coefficient of ROA with cost inefficiency implies that when other things constant and banks want to increase ROA by 1%, the total expenditure of banks can increase by 0.21%. Consequently, leads to increase cost inefficiency of banks. Furthermore, the positive sign of ROA with cost inefficiency shows that banks finance their business activities through customer's interest-bearing time and saving deposit.

Gross Domestic Product (GDP), with negative but insignificant coefficient indicates that there is inverse relationship between GDP and cost inefficiency but has direct relation with cost efficiency.

Recommendations

Since large banks have capable of mobilizing large amount of funds in the economy, they can generate high returns for depositors as well as the equity holders. Moreover, firm size also provides another perspective for analyzing Scale economics and economies of scope of the firms. Therefore, banks could drive economies of scale by maintaining large size.

Higher amount of capital enables banks to invest without raising additional deposits as source of funds with cost of funds (interests). Consequently, the presence of high and stable level of capital enables banks to maintain sustainable cost efficiency by reducing cost of funds (interest expense). Therefore, banks could improve and sustain their efficiency by maintaining available proportion of capital adequacy ratio.

Banks which rely more on deposits to finance assets face a higher funding risk than those that hold a relatively higher proportion of equity capital. Therefore, in order to decrease the costs and risks associated with deposit mobilization and interbank funds, it is advisable banks to be encouraged to attract high value, low interest-bearing demand deposits.

Since there is a positive relationship between credit risk and cost efficiency banks could increase their cost efficiency by improving the proportion of total loans to total assets.

REFERENCES

Adusei, M. (2016). Determinants of bank technical efficiency: Evidence from rural and Community banks in Ghana. *Cogent Business & Management*, 3(1)

Anwar, M. (2017). Cost efficiency performance of Indonesian banks over the recovery period: A stochastic frontier analysis. *The Social Science Journal*, 56(3), 377-389

Beck, T. (2006). *Creating an efficient financial system: Challenges in a global economy,* World Bank Working Paper, No 3856. Washington, D.C.

Bonin, J., Hasan, I., & Wachtel, P. (2005). Bank performance, efficiency and ownership in transition countries. *Journal of Banking and Finance* 29(1), 31-53.

Bottasso, A., & Sembenelli, A. (2004), Does Ownership Affect Firms Efficiency: Panel Data Evidence from Italy, *Empirical Economics,* 29, 769-786.

Charnes, A., Cooper, W., &Rhades, E. (1978). Measuring the Efficiency of Decision-Making Units, *European Journal of Operational Research*, 2(6), 429-444.

Coelli, T. J., & Rao, D. S. (2005). Total factor productivity growth in agriculture*:* A Malmquist index analysis of 93 countries, 1980–2000. *Agricultural Economics,* 32(1), 115–134.

Emishaw, B. (2016). *Determinants of Commercial Banks' Cost Efficiency in Ethiopia: A Stochastic Frontier Analysis.* (Master Thesis). Addis Ababa University, Ethiopia.

Eskinder, W. (2013). Ownership Structure and Cost Efficiency of Commercial Banks inEthiopia: A Stochastic Frontier Analysis, *Unpublished Paper.* Addis AbabaUniversity Economics Department, Addis Ababa, Ethiopia.

Farrell, M.J., (1957). The Measurement of Productive Efficiency. *Journal of the Royal Statistical Society.* 120(3), 253-289

Frederic S. (2004). *The economics of money, banking, and financial markets*/ Frederic S.Mishkin. _7th Seven ed.

Fries, S., &Taci, A. (2005). Cost Efficiency of Banks in Transition: Evidence from 289 Banksin 15 post-communist countries. *Journal of Banking & Finance,* 29(1), 55-81.

GoE. (2010). '*Growth and transformation plan* (GTP) 2010/11 2014/15', draft. Addis

Ababa: Ministry of Finance and Economic Development, Government of Ethiopia.
Haque, A., & Tariq, A. (2012). Efficiency of banks in Pakistan: A Non Parametric Approach. *Business and Economic Research,* 2(1), 1-12.
Hughes, J. & Mester, L. (2008) *Efficiency in Banking: Theory, Practice, and Evidence*. Research Department, Federal Reserve Bank of Philadelphia, Working Paper No. 081.
Hundanol, A. (2012). How efficiently are the Ethiopian MFIS extending financial services to the poor? A comparison with the commercial banks. *Journal of African Economies*. 22(1), 112–135
Isik, I., & Hassan, M. K. (2002). *Technical, scale and allocative efficiencies of Turkish banking industry*. Journal of Banking & Finance, 26(4), 719-766.
Kanfer, R. (1990). *Motivation theory and industrial and organizational psychology*; *Hand book of industrial and organizational psychology (2nd edn).*, Palo Alto, CA. Consulting Psychologist press.
Keatinge, T. (2014). *The role of public and private sector banking in Ethiopia's future economic growth.* Policy brief. Global Center on Cooperative Security: Building StrongPartnerships for a more secure world.
Lucchetti, R. L. Papi, A. Zazzaro (2001) *Banks' Inefficiency and Economic Growth A Micro- Macro Approach*. Development Studies Working Paper no. 153, University of Oxford
Matthews, K. &Mahazir, I. (2006). *Efficiency and productivity growth of domestic & foreign commercial banks in Malaysia*, Cardiff Business School Working Paper Series.
Mester, L. & Allen, B. (2003). Explaining the dramatic changes in performance of US banks:technological change, deregulation, and dynamic changes in competition. *Journal of Financial Intermediation*, 2003, 12(1), 57-95
Mike, K.; Pietro, M.; Veronica, M.; Steve, M.; Bernard, M.; Dina, G.& Andy, N.(2007). Towards a definition of a business performance measurement systemFranco-Santos, Monica; *International journal of operations and production* management, 27(8), 784-801.
Misra, B. (2003). *Allocative Efficiency of the Indian Banking System in the Post reform Period: A State Level Analysis.* Reserve Bank of India, Occasional Papers Vol. 24, No.3, India.
Mohan, R. (2005). Financial sector reforms in India: Policies and Performance Analysis. *Economic and Political weekly*, 40(12), 1106-1121.
Muluneh, A. (2006). *Cost Efficiency of Commercial Banks in Ethiopia: An Application of AStochastic Frontier Analysis*. Addis Ababa, Ethiopia: A Paper Presented at the Fourth International Conference on the Ethiopian Economy Organized by the Ethiopian Economic Association.
Nigmonov, A. (2010). Bank Performance and Efficiency in Uzbekistan.*Eurasian Journal of Business and Economics*, 3(5), 1-25.
Omankhanlen, A. E. (2012). The role of banks in capital formation and economic growth: The case of Nigeria. *Economy Trans disciplinarily Cognition,* 15(1), 103–112.
PardeepKaur & GianKaur (2008). A study of cost efficiency of Indian commercial banks-An impact of mergers. *African Journal of Business Management*, 7(15), 1238-1249
Rama, K. & Tekeste, K. (2012). Cost Efficiency and Ownership Structure of Commercial Banks in Ethiopia. *European Journal of Business and Management*, 4(10), 36 - 47
Raphael, G. (2012). Commercial banks efficiency in Tanzania: A non-parametric approach. *European Journal of Business and Management*, 4(21), 55–67.

Raphael, G. (2013). Efficiency of commercial banks in east Africa: A non-parametric approach. *International Journal of Business and Management*, 8(4), 50–64.

Řepková, I. (2015). *Banking efficiency determinants in the Czech banking sector*. Procedia Economics and Finance, 23, 191–196.

Rostislav, S. (2015), Determinants of Bank Efficiency: Evidence from Czech Banking Sector Acta Universities *Agriculture EtSilvi culturae Mendelianae Brunensis,* 63(3), 1005-1011.

Sanderson, A. & Pierre, R. 2016). *Evaluated the cost and revenue efficiency of the Zimbabwean banking sector during the period of 2009- 2014*. Economic Research South Africa, ERSA, Working paper 629.)

Scott, S. & Timothy, K. (2006). *Management of banking, 6th edition*, Thomson Corporation USA.

Seelanatha, S. (2012). Drivers of technical efficiency of Sri Lankan commercial banks. *International Journal of Applied Economics*, 9(1), 41–58.

Sufian, F.(2008), Determinants of bank efficiency during unstable macroeconomic environment: Empirical: evidence from Malaysia. *Research in International Business and Finance*, 23(1), 54-77.

Tadele, T. (2016). Determinants of commercial banks efficiency: Evidence from selected Commercial Banks of Ethiopia. *International Journal of Scientific and Research Publications*, 6(5), 551–556.

Tadesse, Z. (2017), Determinants of bank technical efficiency: Evidence from commercial banks In Ethiopia. *Cogent Business & Management*, 4(1)

Tecles, T. (2010). *Determinants of bank efficiency the case of brazil*. Working papers Series brazil n.210 may 2010 p. 1-52).

Tesfay, T. (2016). Determinants of commercial banks efficiency: Evidence from selected commercial banks of Ethiopia. *International Journal of Scientific and Research Publications*, 6(5), 551–556.

Tochkov, K. and Nenovsky, N, (2011), *Efficiency of Commercial Banks in Bulgatia in the Wake of EU Accession*. International center for economic research, working paper series, No.21.

Usman, M., Wang, Z., Mahmood, F. & Shahid, H., (2010). Scale Efficiency in Banking Sector of Pakistan,*International Journal of Business and Management*, 5(4), 104-116.

Wang, H. (2008). Heteroscedasticity and Non-Monotonicity Efficiency Effects of A Stochastic Frontier Model, *Journal of Productivity Analysis*, 18, 241- 253.

Determinants of consumers' choice behaviour for fresh fish types

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Abstract

The demand for and supply of fresh fish in many developing countries in the world today Nigeria inclusive, are yet to satisfy the annual dietary needs of their citizenry. This phenomenon, therefore, put unresisting pressure on the need to identify and grow more fresh fish that can meet the socio-cultural and economic desires of consumers. In the light of this, the present study examines the determinants of consumers' choice behaviour for fresh fish types in Nigeria. Primary data were collected from 360 household heads through a structured questionnaire using a multistage sampling procedure. Multinomial logit regression model (MNL) was employed to analyse the impacts of socio-economic and fish-specific attributes of consumer choice for fresh fish. Results showed that 81 per cent were female households with a mean age of 35 years and mean household size of 4 members. Mean years of schooling and monthly expenditure were 13 and ₦3,611.94 (USD10.01), respectively. Mean consumptions of fresh fish category were mudfish (0.3354), catfish (0.1889), tilapia (0.2167), trunk fish (0.1138) and snakehead fish (0.1444). The McFadden R^2 was 0.50 and the validity of independence of irrelevant alternatives hypothesis for the use of MNL was not violated given a p-value of 0.7618. Results showed that consumers' income, price of the fish, level of education, household size, experience and freshness had a significant impact on fresh fish choices. The study therefore recommends that policy that will increase consumers' satisfaction for every naira spent on fresh fish and improve fish qualities should be given proper attentions.

Keywords*: Consumer behaviour, Fish, Multinomial logit, Nigeria*

JEL Classification: C5, D11, B23, Q22

INTRODUCTION

Fishery is a strategic subsector in Nigeria, contributing immensely to the food security of the country. It employs over 8.6 million people directly and 19.6 million indirectly (World Fish, 2018). Nigerian fishing activities are made up of three sources such as artisanal, industrial and aquaculture. Fishery sector provides over 40 per cent of

the total protein-intake in the country and contributes about 0.5% to the national gross domestic product in 2015 (Food and Agriculture Organization [FAO], 2007). Nigeria requires about 2.7 million metric tons of fish annually to satisfy the dietary needs of its citizens. However, the aggregate total domestic fish supply from all sources, both from capture and culture fisheries, is about 0.8 million metric tons per annum thereby creating a deficit of 1.9 million tons to fill the demand-supply gap (Emefiele, 2019). Consequently, over $1.2 billion is being spent on the importation of frozen fish annually to bridge this gap (FAO, 2007). Available information revealed that only 30 percent of the fish consume in Nigeria can be produced domestically while the remaining 70 percent is being imported. Meanwhile, Nigeria is the largest importer of frozen fish in Africa. This has serious implications for the Nigerian population of about 195 million with 2.6 percent annual growth rate (World Bank, 2018). The country has a comparative advantage of producing fresh fish abundantly for both local consumptions and export the surplus. This is premised on the fact that it has a coastline of 853km (Central Intelligence Agency [CIA], 2014) couple with 200 nautical miles of Exclusive Economic Zone.

For more than 35 years, Nigeria aquaculture grows by about 12 per cent a year compare to the World average of 8 per cent from over 6,000 metric ton in 1980 to about 307,000 tons in 2016 (World Fish, 2018). Nigeria is the largest aquaculture fish producer in sub-Sahara Africa, accounting for 52 per cent of the total fish farmed in the region (World Fish, 2018). The country's aquaculture focuses on freshwater fish, with catfish as major species. Despite the availability of water and human resources in the country, the demand for fish continues to exceed its domestic production annually. In Nigeria, per capita consumption of 13.3kg/person of fish are still relatively low compared with the global average of 20.0kg (FAO, 2007).

Notwithstanding a number of economic literatures have made us to know that socio-economic and product-specific variables have significant influences on consumers' preferences for a product in behavioural studies, relatively few have assessed the impacts of these factors on consumers' choice behaviour for fresh fish types especially in the study area. A number of studies reviewed show that gap exists in the study area. For instance, Qiujie et al. (2018) investigated factors influencing consumers' purchase intentions for sustainable wild salmon in the Chinese market and implications for agribusiness decisions using ordered logit model. The result of their study showed that education, household size, increase in income over the last two years, dummy for Shanghai city, harvest methods, tasty, cleanliness, dinning venue (i.e. eat salmon at home, restaurants and both) had a positive and significant influence on consumers' purchase intentions while factors like preservation by frozen, place of eating salmon other than home and restaurants had negative but significant impact on the consumers' intention for wild salmon in the study area. The authors also modeled factors influencing consumers' intentions for purchasing wild salmon heads and bones from Alaska. The result was that consumers with college education, method of harvesting of salmon, dinning venue such as home and restaurant, cleanliness and nutritious were all have positive significant impacts on consumer' intention to buy heads and bones of wild salmon. However, consumer' annual income, preservation with water, preservation by frozen, and other places where wild salmon could be obtained for consumption were negatively signed but had significant relationship with consumers' intention to purchase heads/bones of wild salmon. The study therefore concluded that factors such as consumers' perception on the food safety, sustainability of production environment and taste played a significant role in purchase intentions for wild salmon

fillet while positive perception of the production environment and nutritious induced consumers to have more purchasing intention for wild salmon heads/bones.

Azabagaoglu et al. (2016)'s study was conducted on consumer's fish purchase behavior in Tekirdag in Turkey using best-worst analysis. The study found that the major reason for consuming fish in the study area was because of its healthiness while the reason for not buying fish was identified as difficulty associated with fish preparation. Nauman et al. (1995) employed logit regression model based on a modified evoked set framework to examine the effects experience, perceptions and preferences have on the decision of consumers to purchase fresh hybrid striped bass, trout and salmon in Northeastern USA. Results of the study reported that production environment, experience on seafood purchases, .healthiness and taste had a positive and significant impacts on consumer decision to buy fresh finfish.

The study by Adeola et al. (2016) focused on marketing perspective of smoked catfish in Southwest, Nigeria using Tobit model to analyze field survey. The study identified consumer's income and household size as factors that had positive influence on catfish consumption. Bonface et al. (2017) employed Almost Ideal Demand System and multivariate probit model to analyze the demand for fish products in Malawi. The study concluded that socioeconomic variables were significantly related to fish demand while Kreider et al. (1993) analysed consumer perceptions of fresh fish and seafood in the Delmarva region using chi-square of independence. The study identified freshness, a good appearance, flavour and safety as factors influencing consumers in purchasing fresh fish and seafood while taste, odour and price were the major factors preventing consumers from purchases seafood. George et al. (2017) used choice experiment to examine households' willingness to pay for fish product attributes and implications for market feasibility of wastewater-based aquaculture businesses in Hanoi, Vietnam. The study reported that household decision to purchase fish was influenced by access to information on fish attributes to know if waste water was used to rear fish, certification, age, income and household size. Similarly, Jimoh et al. (2013) evaluated consumers' preference for fresh and frozen fish products in Ibadan metropolis, Nigeria. The decision to purchase fresh and frozen fish is influenced by education, occupation, family expenses, taste, package, cost and availability of the fish. Ratliff (2017) investigated factors influencing consumer preferences for tangible and intangible seafood characteristics and community supported fishery marketing outlets in South Carolina using ordered probit and multinomial logit models. Results of the study indicated that demographic characteristics and lifestyle have significant impact on both tangible and intangible seafood characteristics. Moses et al. (2015) investigated socio-economic characteristics influence on consumers' preference on fish purchase in Yola North Local Government Area of Adamawa State, Nigeria using multiple regressions. The study concluded that consumer' preferences were positively influenced by age, education, income and household size of the respondents while Can et al. (2015) in Turkey found out that number of fish species consumed and age of respondent are factors influencing fish consumption. The study used multiple regressions to predict factors affecting fish consumption in their study area.

From the foregoing, studies on consumers' choice behavior for fresh fish are still relatively scarce, thus posing a serious challenge to the formulation of appropriate policy in the study area. Previous studies focused on smoked and frozen fish without adequate consideration to look at the factors affecting the choice of consumers for fresh fish types. These inadequacies create a gap for this study to fill. This study is therefore considered to gain more insight into the influence of socioeconomic variables and fish

specific-attributes of consumers' choice behaviour for fresh fish types in Nigeria. Specifically, the study described the socioeconomic characteristics of consumers and identified factors affecting the choice of consumers for fresh fish type (The following fish were selected based on their consumption frequency- catfish, mudfish, tilapia, trunk fish and snake head). Therefore the results from this study are expected to provide relevant information for policy makers, captains of industries and researchers.

THEORETICAL MODEL

The concept employs in this study is built in general, on random utility theory with the assumption that every consumer is a rational decision maker. Utility is a benefit an individual *n* could derive from choosing an alternative *i*. Every individual is assumed to be rational relative to his choices. Considering an individual *n* making a decision involving an exclusive alternative that constituted a choice set (C_n) of fresh fish types in our own case, the choice set may vary depending on the household. The selection of fresh fish type *i* by an individual *n* from his/her choice set is based on perceived utility U_{in} of the choice. The utility maximizing behaviour of the consumer is that the consumer *n* chooses fresh fish type *i* if, $U_{ni} > U_{nj} \quad \forall_j \neq i$ ..... (1)
where, U_{ni} is the utility of individual n choosing option i
U_{ij} = is the utility of individual *n* for choosing alternative j

But let us consider a researcher who is investigating consumer choice. The choice of the consumer depends on many factors. Some of the factors are observable and some are not observable. This utility decomposes into various components that depend on factors that fall within the model and factors outside the model but can influence consumer choice. The linear form of this model can be written as

$$U_{ni} = \beta\pi_{ni} + \varepsilon_{ni} \quad \text{.....(2)}$$

We can deduce equation (3) from 2 as

$$\pi_{ni} = \pi(X_{ni},\ S_n) \quad \text{..... (3)}$$

From equation (3), π_{ni} = a vector of observed variables relating to alternative *i* for individual household that depends on the attributes of the alternative, X_{ni} = vectors of attributes describing interaction between alternatives *i* and *j*, respectively. S_n = vector of individual characteristics that influence his/her choice. β= is the vector of the coefficient of observed variables while ε_{ni} = vector of random component that captures the effects of all unobserved variables that affect individual choice Bateman et al. (2002) and recently cited in (Owusu-Sekyere, 2014).

The conditional probability of his choice then becomes.

$$P(i/C_n) = P_r\left(\bigcap_{j\neq i} \beta\pi_{ni} + \varepsilon_{ni} > \beta\pi_{nj} + \varepsilon_{nj,}\right) = P\left(\bigcap_{j\neq i} \varepsilon_{nj} - \varepsilon_{ni} < \beta\pi_{ni} - \beta\pi_{nj,}\right) \text{..... (4)}$$

Given β, the choice probability is the probability that $\varepsilon_{ni} - \varepsilon_{nj}$ are below the respective quantities $\forall_{j\neq i}$: $\beta\pi_{ni} - \beta\pi_{nj}$. Different choice models depend on the assumption about the distribution of error term for all *i* and different treatment of β. In this study, we assume that our random components for multinomial logit specification are identically and independently distributed across the error terms, (i.e the error terms follow Gumbel distribution).

METHODS

The study was carried out in Ondo State, Nigeria. The state is bounded in the west by Osun and Ogun States and in the north by Ekiti and Kogi States. Ondo State shares

boundaries with Edo and Delta States in the east and in the south by the Atlantic Ocean. Ondo State lies between Latitudes 5º 45′ and 8º 15′ north of the equator and Longitude 4º 30′ and 6º 60′ east of the Greenwich Meridian. Ondo State has eighteen (18) Local Government Areas with an estimated population of about 3.4 million inhabitants (National Population Commission [NPC], 2006). There are two distinct seasons which are the rainy season (April to October) and the dry season (November to March). Though, there is usually an August break for a period of two weeks. The annual rainfall varies from 1,150mm to 2,000mm. Ondo State riverine area is a veritable ground for fishing.

Primary data used in this study were collected from the household heads using a structured questionnaire. A multi stage sampling procedure was employed to select respondents. The first stage involved the purposive selection of Akure-south and Owo Local Government Areas because of high population of households in the areas. In the second stage, five communities were purposively selected for convenient administration of questionnaire from each of the LGA. In the third stage, 36 respondents were randomly selected from each of the five communities earlier selected in each local government areas thereby giving a total of 360 respondents used in this study.

Data estimation

This study used tables, mean and standard deviation to summarize the socioeconomic characteristics of the respondents and inferential statistics such as multinomial logit regression to identify factors determining the choice of consumers for fresh fish types.

Multinomial logit regression model

Following Greene (2003); multinomial logit regression model (MNL) is the standard method for estimating unordered, multi-class or polytomous dependent variables. When there are more than two alternatives, the preferred model is MNL. The choice of consumers' preference j^{th} is drawn from the J^{th} fresh fish types using a probability set. Therefore, MNL was used in this study to identify factors affecting the choice of consumers for fresh fish types in the study area. One of the categorical variables was set as a reference category. Several researchers have used this model to analyse choice of products or techniques. Multinomial logit regression model is expressed as:

$$\frac{P(Y=j/X)}{P(Y=J/X)} = exp^{\left(\beta_0 + \sum_{j-1}^{J} \beta_j X_{ji}\right)} \quad \text{.....(5)}$$

The marginal effects were computed to capture the effect of independent variable on dependent variables. This is because the P(Y = j/X) must sum to one. It is therefore easy to establish that:

$$P(Yi = j/Xi) = \frac{\exp^{\beta_j X_{ji}}}{1+\sum_{J=1}^{J-1} \exp^{\beta_j X_{ji}}} \quad \text{..... (6)}$$

By setting $\beta^1 = 0$, the equations become

$$P(Y_i = 1) = \frac{1}{1+e^{X\beta^{(2)}} + e^{X\beta^{(3)}} + e^{X\beta^{(4)}} + e^{X\beta^{(5)}}} \quad \text{.....(7)}$$

$$P(Y_i = 2) = \frac{\exp^{\beta^{(2)}}}{1+e^{X\beta^{(2)}} + e^{X\beta^{(3)}} + e^{X\beta^{(4)}} + e^{X\beta^{(5)}}} \quad \text{..... (8)}$$

$$P(Y_i = 3) = \frac{\exp^{\beta^{(3)}}}{1+e^{X\beta^{(2)}} + e^{X\beta^{(3)}} + e^{X\beta^{(4)}} + e^{X\beta^{(5)}}} \quad \text{..... (9)}$$

$$P(Y_i = 4) = \frac{\exp^{\beta^{(4)}}}{1+e^{x\beta^{(2)}}+e^{x\beta^{(3)}}+e^{x\beta^{(4)}}+e^{x\beta^{(5)}}} \quad (10)$$

$$P(Y_i = 5) = \frac{\exp^{\beta^{(5)}}}{1+e^{x\beta^{(2)}}+e^{x\beta^{(3)}}+e^{x\beta^{(4)}}+e^{x\beta^{(5)}}} \quad (11)$$

Where,
From equation 5, Y = Mudfish = 1 catfish= 2, tilapia= 3, trunk fish = 4, snakehead = 5
X = set of row vector of explanatory variables,
β_j = parameters to be estimated (j = 1, 2, 3… J), and
β_0 = intercept. The parameters of these equations were estimated through the method of maximum likelihood estimation using STATA version 14.

Socio-economic characteristics of fresh fish consumers

Table 1 presents the descriptive statistics of consumers and fresh fish-specific attributes in the study area. Most (81 percent) of the respondents were female households with about 73 percent of the households were married which implies that the married buy more fresh fish than unmarried. The result is similar to the earlier study conducted by Solomie et al. (2015) that women were the primary food shoppers in most households. The mean age of respondents was 35 years with a mean household size of 4 members while the mean educational status was 13 years which implies that consumers in the study area have adequate knowledge and awareness to process information about fish attributes.

Table 1. Summary statistics of the variables and fresh fish types

Description	Variable	Mean	Std. dev.
FRESH FISH TYPE	-	2.541	1.421
FF_TYPE = 5	SNAKEHEAD	0.144	0.352
FF_TYPE = 4	TRUNKFISH	0.113	0.318
FF_TYPE = 3	TILAPIA	0.216	0.413
FF_TYPE = 2	CATFISH	0.188	0.392
FF_TYPE = 1	MUDFISH	0.335	0.473
If female = 1, 0 otherwise	D_GENDER	0.805	0.396
If married =1, 0 otherwise	D_MAR STATUS	1.733	0.443
Number of years spent in schooling	EDUCATION	13.7166	3.409
Number of persons living under the same roof	HHSIZE	4.4944	2.218
Years since birth	AGE	34.9167	10.013
Years of experience in consumption of fresh fish	EXPERIENCE	25.0806	9.433
Having a good taste =1, 0 otherwise	D_TASTE	0.655	0.476
If health is the condition for purchase yes =1, 0 otherwise	D_HEALTHINESS	0.255	0.437
If freshness of the fish attract consumer to purchase yes =1, 0 otherwise	D_FRESHNESS	0.416	0.194
If plenty fish meat is the consideration for purchase yes =1, 0 otherwise	D_FLESHINESS	0.85	0.358
If odour discourages purchases yes =1, 0 otherwise	D_ODOUR	0.561	0.497
Having little bone in the body: yes =1, 0 otherwise	D_BONE	0.672	0.47
If it is easy to prepare yes =1, 0 otherwise	D_EASE PREP	0.738	0.44
Market price of all fishes considered in the study NGN(₦)/kg	PRICE PER FISH	710	154.108
The monthly disposable income (₦)	HHINCOME	75,631.42	68602.82
Average household expenditure on fresh fish per month	EXPENDITURE	3611.94	2905.51

*note price, expenditure and income are expressed in Nigeria currency $1=N361
Source: Field survey, 2019

Result showed that majority of the consumers sampled were married, 73 percent of the sampled attributed choice to a simple preparation of fresh fish. The study showed that 66 percent made their choice on the basis of the taste of the fish, 56 percent did not buy because of fish odour, 26.0 percent of the respondents based choice decision on the provision of good health deriving from eating fresh fish while 42 percent of the consumers considered freshness of the fish as a pre-condition to purchase fish. Many (85 percent) consumers preferred to purchase fleshy fish while consumers eat fresh fish if it contains less bone (67 percent) and 74 percent purchase fresh fish if it is easy to prepare. The study revealed that the average price of fresh fishes was ₦710.0 (US$1.97) while the monthly mean expenditure on fresh fish was ₦3,611.94 (US$10.12).

RESULTS AND DISCUSSION

Marginal effects of multinomial logit model

The coefficients of multinomial logit regression are displayed in Table 2. The estimated coefficient can only show the direction of variables but the magnitude of the effect on the response variables can be given by taking the derivatives of the response variables with respect to individual factor. Therefore, this study discusses the marginal effect of multinomial logit regression to identify factors influencing choice of fresh fish consumed in the study area.

Table 2. Parameter estimates of multinomial logit regression for fresh fish types

Model	Catfish Coeff,(Std.err)	Tilapia fish Coeff(Std.err)	Trunk fish Coeff.(Std.err)	Snakehead fish Coeff.(Std.err)
CONSTANT	-393.6746(146.8571)***	-1053.611(189.2904)	1032.3089(220.7750)	-1686.24 (300.6990)
D_GENDER	-0.6726(0.4695)	-0.6673(0.5803	0.229214(0.7318)	-1.0385 (1.0286)
D_MAR STAT	0.6389(0.5370)	0.1908(0.6515)	-0.3698(0.7502)	2.0147 (1.1080)
LOG_EDUCATION	-6.0005(5.2808)	-27.7010(6.6620)	-32.6845(7.9633)	-47.8287 (10.7264)
LOG_HHSIZE	-15.3499(5.9967)**	-40.1635(97.7287)	-43.2849(9.0450)	-56.5734 (11.5314)
LOG_AGE	11.1524(2.5852)***	8.231377(2.9832)	9.5998(3.2947)	7.1491 (4.5588)
LOG_EXPERIENCE	-13.5785(3.7472)***	-25.2728(4.9722)	-26.70466(5.8273)	-50.6734 (8.6566)
D_TASTE	0.2362(0.4560)	0.0045(0.5415)	-0.6089(0.6414)	-0.3325 (0.9000)
D_HEALTHINESS	-0.7161(0.6567)	-0.8320(0.7909)	-1.4132(0.9199)	0.8912 (1.2246)
D_FRESHNESS	3.4796(0.7342)***	8.0371(0.9919	9.4509(1.1202)	15.7383 (1.8146)
D_FLESHINESS	0.3666(0.6467)	0.7269(0.7019	1.7080(0.9294)	2.9709 (1.5093)
D_ODOUR	1.1528(0.4071)***	1.0171(0.4723)	1.4116(0.5516)	2.0125(0 .8518)
D_BONE	-0.0311(0.5217)	-1.7344(0.6466)	-1.9311(0.7528)	-3.4384 (1.1030)
D_EASE PREP	1.1388(0.4973)***	3.8290(0.7082)	2.8529(0.7409)	5.6719 (1.1067)
LOG_PRICE	64.3331(26.8620)**	177.5546(34.8488)	176.5736(41.0023)	282.5933 (54.9891)
LOG_INCOME	1.13129(0.7208)	3.4506(0.8623)	4.6747(1.0498)	10.2877 (1.955252)
LOG_EXPENDITURE	3.78442(1.6135)**	9.0856(9.0856)	9.0440(2.4653)	16.7797 (3.3677)

*Note McFadden R^2 = 0.4899, Log likelihood = -277.78258, ***, **, * indicates that estimates are significant at 1%, 5% and 10%, respectively.

Source: Field survey, 2019 figures in parenthesis are S.E *** ** * sig. at 1%, 5% and 10% respectively.

Table 3 shows the marginal effects and standard errors estimated from the multinomial logit regression. There are five levels of dependent variables with mudfish being set as the base category to normalize the coefficients of the outcome. The overall percentage correct classification of the MNL models estimated for mudfish, catfish, tilapia, trunk fish and snake-head using SPSS version 25.0 was 63.3%. The overall adequacy of the model was judged by its F-statistics with a value of chi-square (552.91) and a p-value less than one percent. The McFadden's R^2 value was 0.50 which indicates that our model has a better fit. Similar to the work of Hausman and McFadden (1984), we tested assumption of independence of irrelevant alternatives (IIA) hypothesis under the null hypothesis that differences in coefficients are not systemic. We obtain a p-value of 0.7618 which indicates that IIA is not violated, suggesting that our model is appropriate for modeling consumer' choice behavior for fresh fish types.

Table 3. Determinants of consumer choice behaviour for fresh fish types

Model	Mudfish (∂y/∂x)	Catfish (∂y/∂x)	Tilapia (∂y/∂x)	Trunk fish (∂y/∂x)	Snake-head (∂y/∂x)
D_GENDER	0.0547(0.04164)	-0.0542(0.0435)	-0.0430(0.0456)	0.0639(0.04134)	-0.0214(0.0256)
D_MAR STATUS	-0.0402(0.0466)	0.0671(0.0511)	-0.0183(0.0508)	-0.0675(0.0403)	0.0590(0.0256)**
LOG_EDUCATION	1.3640(0.4339)***	0.9210(0.4582)**	1.4721(0.4945)***	-0.7509(0.3873)*	-0.5943(0.2348)**
LOG_HHSIZE	2.3344(0.4593)***	0.4843(0.5044)	1.4721(0.4945)***	-0.8282(0.4266)*	-0.5183(0.2513)**
LOG_AGE	-0.9677(0.2055)***	0.8106(0.202)***	0.0599(0.1979)	0.1485(0.1560)	-0.0513(0.1053)
LOG_EXPERIENCE	1.7059(0.2794)***	-0.1145(0.3087)	-2.8367(0.8907)	-0.2463(0.2789)	-0.7659(0.1872)***
D_TASTE	-0.0082(0.0398)	0.0371(0.0434)	0.0195(0.4362)	-0.0450(0.0355)	-0.0033(0.0220)
D_HEALTHINESS	0.0767(0.0570)	-0.0319(0.0620)	-0.0287(0.0611)	-0.0728(0.0491)	0.0567(0.0270)
D_FRESHNESS	-0.5011(0.0356)***	-0.0732(0.0347)**	0.1843(0.0375)***	0.1666(0.03037)***	0.2234(0.0277)***
D_FLESHINESS	-0.0574(0.0541)	-0.0177(0.0633)	-0.0398(0.0575)	0.0593(0.0549)	0.0557(0.0379)
D_ODOUR	-0.1086(0.0334)***	0.0683(0.0367)*	-0.0100(0.0363)	0.0247(0.0210)	0.0016(0.0019)
D_BONE	0.0636(0.0453)	0.0961(0.0479)**	-0.0685(0.0486)	-0.0388(0.0396)	-0.0523(0.0257)**
D_EASE PREP	-0.1904(0.0389)***	-0.0636(0.0436)	0.1943(0.0487)***	-0.0131(0.0335)	0.0730(0.0233)***
LOG_PRICE	-9.9732(2.1014)***	-2.3847(2.24113)	6.6819(2.2777)***	3.4243(1.2055)***	0.2659(0.2721)
LOG_INCOME	-0.2006(0.0582)***	-0.0906(0.0616)	0.0158(0.0618)	0.0821(0.0544)	0.1933(0.0433)***
LOG_EXPENDITURE	-0.5410(0.1351)***	-0.0715(0.1432)	0.2890(0.1500)*	0.0814(0.1221)	0.2421(0.0708)***

*Note : Figures in parenthesis are S.E, *** ** * indicates that estimates are sig. at 1%, 5% and 10% respectively, AIC = 649.5652, BIC = 832.212,
Source: Field survey, 2019

Mudfish model

Table 3 shows that consumption of mudfish is influenced by both socio-economic of the respondents and fish-specific attributes. The choice of mudfish is reduced by the following variables as freshness, fleshy fish, odour and easy to prepare at 1% probability level of significance. That is, a unit change in any of these variables, consumers will be less likely to purchase mudfish compared to non-freshness, non-fleshy fish, odorous fish and not easy to prepare. In the like manner, results show that increase in the average price of fresh fish, household expenditure on fish, consumer's experience, household income and age variables will significantly decrease the purchase of mudfish, thus indicating that a 1% increase in these variables does not translate into increased consumption of mudfish but will rather decrease its choice from the food basket. Similar result was found by George et al. (2017) for willingness to pay for fish attributes in Vietnam.

The negative coefficient of household income variable shows that a large number of consumers spend less of their income on fresh fish as income increases in the study area. The result, however, differs from the finding of Abdullahi et al. (2011) that found direct relationship between income and consumer behaviour for fresh fish in Malaysia. Also, a 1% increase in the price of mudfish will cause a consumer to lower his /her demands for mudfish by 10 per cent. However, education of household and number of household members had positive and significant influence on the choice of mudfish at 5 per cent level. Abdullahi et al (2011) reported similar result for effect of household size of fresh fish in Malaysia. Increasing these variables at 1% will make consumers to be more likely to choose mud fish by 36 and 33 per cent, respectively.

Catfish model

The probability of choosing catfish from the food basket decreases with freshness of the fish significantly at the 5 per cent level. However, good odour and less bony fish increase the probability of consumption of catfish in the fresh fish food basket in the study area compared to bad odour and bony fresh fish types. The results also indicate that the age of the respondent and education of household head increase with the probability of the choice of catfish significantly and consistently at the one and 5 per cent levels, respectively. As a matter of fact, addition of one year to the age of the respondents provides him/her the opportunity to weigh the benefit of eating or not

eating fresh fish. Likewise consumers who are educated will have a better understanding than uneducated consumers. It also afford consumer to consider those qualities in fish like Omega-3 compared to red meat.

Tilapia model

In tilapia model, result reveals that freshness and easy to prepare variables are positively significantly related to the probability of choosing tilapia fish at the one per cent compared with a non-freshness and not easy to prepare fish. Also, the marginal effect of price of fish on the consumption of tilapia was not consistent with the theoretical expectation. Intuitively, consumer choice behaviour for fresh fish in the study area is associated with strong preference and habit. The probability of purchasing tilapia fish increases with a unit price increase by 6.6%. Further scrutiny of the results show that expenditure of household head on fresh fish had direct impact with the choice of tilapia category but this however decreases with the education of the household head and household size. The finding on education of the household head as well as household size of the respondent is consistent with the earlier work done by Solomie et al. (2015) on consumer preference and willingness to pay for farmed in treated wastewater in Ghana.

Trunk fish model

The demand for the choice of trunk fish increases significantly and consistently with the freshness variable at the one per cent level compared to non-freshness. For the average price of fresh fish, the decision to purchase trunk fish also increases by a one unit increase in price but decreases with education of the household head and household size. Education of a consumer will be of good help to understand and process empirical information reported on nutritional values of food like fresh fish types and then takes decision. On the other hand, large household size may decide to buy less of trunk fish if income is low couple with high price of fresh fish.

Snakehead fish model

For the snakehead fish model, results obtained show that probability of demand for snake-head fish type increases with the following freshness, ease to prepare, income of household head, expenditure on fresh fish and marital status. The variables are positively and statistically significant at the probability level of 1 and 5 per cent, accordingly. It also implies that consumers are more likely to buy snake-head fish compared with fish that are not fresh or ease to prepare. A one unit increase in income variable indicates that the probability of purchasing fresh fish from the food basket favours snake-head fish, *ceteris paribus*. The result here is theoretically consistent with the law of demand. However, bony fish, experience in the consumption of fish and education of the respondent decrease with the probability of choosing snakehead fish. This suggests that consumers will be less likely to choose snake-head fish, if there is a-one unit increase in any of the variables, holding other explanatory variables constant. People with less education are less likely to select snake-head because of lack of awareness and knowledge about the health benefits that can be derived from snake-head.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The study was carried out to investigate underlying factors affecting consumers' choice behaviour for fresh fish types in Nigeria. Specifically, the study described the

socioeconomic characteristics of consumers and identified factors affecting the choice of consumers for fresh fish type (e.g. cat fish, mudfish, tilapia, trunk fish and snake head).

A multi stage sampling procedure was used to select 360 household heads in the study area being one of the major fishing grounds in Nigeria. A structured questionnaire was used to retrieve pertinent information on socio-economic variables and fish-specific attributes. Descriptive statistics such as table, mean and standard deviation were used to summarize the socio-economic characteristics of the consumers and inferential statistics such as multinomial logit model was used to identify factors determining consumers' choice behaviour for fresh fish types in the study area.

Most (81 percent) of the household heads were females. The mean age of household heads was 35 years with an average household size of 4 members while the mean years of schooling was 13 years. Results further showed that majority of the consumers sampled were married, 73.0 percent purchased fish due to easy preparation, 56.0 percent desired fish without odour, 74.0 percent of consumers purchased fresh fish on health ground while 42.0 percent of the consumers considered freshness of the fish as a pre-condition to purchase fish while 74 percent of household heads based purchases on good taste. The study revealed that the average price of fresh fishes was ₦710.0 (US$1.97) and monthly mean expenditure on fresh fish was ₦3,611.94 (US$10.12).

The study further showed that education and number of household members determine the choice of mudfish. For catfish, the study concluded that improvement on fish odour, bone, education and age will motivate consumers to buy catfish. For the snakehead fish model, results obtained show that probability of selecting snake-head fish type increases with the following variables freshness, ease to prepare, income of household head, expenditure on fresh fish and marital status while bony fish, consumption experience and education of the respondent are likely to decrease with the probability of choosing snakehead fish. People with less education are less likely to buy snake-head fish because of lack of awareness and knowledge about the health benefits that can be derived from it. The study also concluded that the decision to purchase trunk fish also increases by an increase in fish price but decreases with education of the household head and household size.

Recommendations

Based on the findings in this study, it is recommended that government should encourage fish farmers to grow more of fresh fish category presented in this study through aquaculture for local consumption and if possible for export. The result also suggests that government and private sector should provide research funding that stimulates researches on genetic manipulation of these fish categories to reduce fish odour and gain more flesh. To keep fish fresh always, provision of storage facilities should also be provided to avoid unnecessary wastage. Policies on consumer protection that lays emphasis on fish quality, education and health should be strengthened in the country.

REFERENCES

Abdullahi, F. A., Zainalabidin, M. & Mohd, M. I. (2011). Determinants of Fresh Fishpurchasingbehaviour among Malaysian Consumers. *Current Research Journal of Social Sciences* 3(2), 126-131.

Adeola, A. A Ayegbokiki, A. O, A kerele, D, Adeniyi, B. T & Bamidele, N. A. (2016). Marketing Perspective of Smoked Catfish by Consumers in Southwest, Nigeria. *Applied Tropical Agriculture*, 21(2), 58-66

Azabagaoglu, M., Abdikokoglu, O. D. I. & Unakitan, G. (2016). Consumer's Fish Purchase Behaviour in Tekitdag. *Journal of Tekirdag Agricultural Faculty*, 13(04), 145-151.

Bateman, J. Carson, R. T., Day, B., Hanemann, W. M., Hanley, N., Hett, H., Lee, M. J., Loomes, G., Mourato, S., Özdemiroglu, E., Pearce,W. D. & Elgar, E. (2002). *Economic valuation with Stated Preference Techniques: A Manual*, Edward Elgar Publishing, Inc.

Bonface, N., Emmanuel, K. & Sloans, C. (2017). The Demand for Fish Products in Malawi: An Almost Ideal Demand System Estimation: *Journal of Economics and Sustainable Development*, 8(16), 63-71

Can, M. F., Gunlu, A. & Can, H. Y. (2015). Fish Consumption Preferences and Factors Influencing it. *Food sci. Technology, Campinas*, 35(2), 339-346. DOI: http://dx.doi.org/101590/1678-457x.6624.

CIA World Factbook, (2014): http://www.factfish.com/country/Nigeria

Emefiele, G. (2019). *Fisheries committee for the West Central Gulf of Guinea*. Available at: https://www.vanguardngr.com/2019/09/nigeria-spends-1-2bn-to-import-fish-annually-emefiele.

Fishery and Aquaculture Country Profile, Nigeria. (2007). *Country Profile Fact Sheets*. In: FAO Fisheries and Aquaculture Department (Online) Rome Updated 1 November 2017 Available at: http://www.fao.org/fishery/

George, K. D. Miriam, O., Nguyen, D. L. & Ganesha, M. (2017). Households' Willingness to Pay for Fish Product Attributes and Implications for Market Feasibility of Wastewater-Based Aquaculture businesses in Hanoi, Vietnam. *Resource*, 6, 30. DOI: http://doi.10.3390/resources6030030

Greene, W. H. (2003). *Econometric Analysis Fifth Edition*, Pearson Education International Upper Saddle River, New Jersey.

Hausman, J. A & McFadden, D. L. (1984). *Specification Tests for the Multinomial Logit Model Econometrica* 52: 1219-1240

Jimoh, W. A., Popoola M. A., Ibeahim, G. A., Ayeloja, A .A., Ayanwale, A. O. S & Akinosho, G. A (2013*) Evaluation of consumers' preference for Fresh and Frozen Fish Products in Ibadan metropolis, Nigeria. PAT*, 9(1) 13-20

Kreider, C. K., Gempesaw, C. M., Bacon, J. R., Toensmeyer, U. C & Groff, A. J. (1993). An Analysis of Consumer Perceptions of Fresh Fish and Seafood in the Delmarva Region, *Journal of food distribution research,* 24(2), 37-48.

Moses, J. D., Daniel, A. D, Giroh, D. Y., Zalkuwi, J. & Akindele, O. (2015). The Influence of Socio-Economic Characteristics on Consumers' Preference on Fish Purchase in Yola North Local Government Area, Adamawa. *International Journal of Environmental and Agricultural Research*, 1(7), 1-11

National Population Commission (2006). Official Gazette (FGP/71/52007/2,500(OL24). *Legal Notice on Publication of the Details of the Breakdown of the National and State Provisional Totals 2006 Census*, Available at: http://www.nigerianstate.gov.ng.

Nauman, F. A., Gempesaw, C. M., Bacon, J. R & Manalo, A. (1995). Consumer Choice for Fresh Fish Factors Affecting Purchase Decisions. *Marine Resource Economics,* 10, 117-142.

Owusu-Sekyere, E. (2014). *Consumer Preferences and Willingness to Pay for Beef Attributes in Ghana*. M.sc Thesis in Agricultural Economics, Faculty of Natural and Agricultural Sciences, Department of Agricultural Economics, University of the Free State. Bloemfontein

Qiujie, Z. 1, H. Holly, W. & Yonggang. L. (2018). Consumer Purchase Intentions for Sustainable Wild Salmon in the Chinese Market and Implications for Agribusiness Decisions. *Sustainability* 10(5), 1-16.

Ratliff, E. A. (2017). *Factors Influencing Consumer Preferences for Tangible and Intangible Seafood Characteristics and Community Supported Fishery Marketing Outlets*, All Theses 2772. Available at: http://tigerprints.clemson.edu/all theses/2772.

Solomie, A. G, Amewu, S & Philip, A. (2015). *Consumer Preference and Willingness to Pay for Farmed in Treated Wastewater in Ghana*. Selected Paper Prepared for Presentation at the 2015 AAAEA& WAEA Joint Annual Meeting, San Francisco California, 26-28 July 2015.

World Fish, (2018). *World Fish Nigeria Strategy 2018-2022* Penang Malaysia.

World Bank, (2018) . *Annual Population Growth, Nigeria* World Bank Data. Available at: data.worldbank.org

Investigation of financial inclusions, financial literation, and financial technology in Indonesia

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Abstract

The Indonesian Financial Services Authority (Otoritas Jasa Keuangan) states that the financial literacy increase will be followed by developing the financial inclusion index. Nevertheless, the level of public financial literacy is still far behind the financial inclusion index. Perpres No. 82 of 2016 concerning the National Inclusive Finance Strategy sets a target of 75% of the adult population to access financial services in 2019. As information technology develops and internet penetration rates rapidly emerge, digital financial services emerge that make it easier for people to obtain financial services called financial technology. The increasing use of financial technology is one of the drivers for increasing national financial inclusion. This study aims to investigate studies of financial inclusion, financial literacy, both from knowledge, behavior, and financial attitudes, and financial technology. The research is a literature study research examining thirty journals and reports related to Financial Inclusion, Financial Literacy, and Financial Technology. Formed on the respondents' characteristics, gender, age, education, and occupation had an impact on increasing financial inclusion, financial literacy, and financial technology in Indonesia. Many people use financial products and services without having a good knowledge of the functions, how to choose the right according to needs, and do not know the risks of the products used. Recommendation from this is a strategy strategic of the respondents' characteristics is needed in increasing financial inclusion.

Keywords*: Financial inclusion, Financial literacy, Financial technology*

JEL Classification: L51, L86, L88, O33

INTRODUCTION

Financial literacy is financial awareness and knowledge of financial products, financial institutions, and concepts regarding skills in managing finances (Xu & Zia 2012). As stated by the Financial Services Authority (2016), financial literacy is knowledge, skills, and values affecting behaviors and attitudes to strengthen decision-making and financial management to prosper. Consumers of financial products and services, as well as the broader community, are expected. People are aware of and

understand financial services institutions, financial products, and services and can alter or change people's behaviors to enhance their financial management welfare.

People with low financial literacy levels will be easily deceived in using their money (Lestari, 2015). Conversely, people who have high financial literacy levels will utilize financial products and services that suit their needs. They can then do better financial planning, avoid investing in unclear financial instruments, and understand the benefits and risks of products and financial services. The National Survey of Indonesian Financial Literacy and Inclusion in 2019, conducted by the Financial Services Authority, provides an overview of Indonesia's financial literacy condition, which is still low. However, it has increased from surveys conducted previously in 2016 and 2013. Literacy rates Indonesian public finance in 2019, which is around 38.03%, which means that out of every 100 people, there are only around 38 people in the well literate category.

One of the things that can overcome various causes of the still low financial literacy in Indonesia is the emergence of a program to expand financial inclusion. Presidential Regulation number 82 of 2016 concerning the National Financial Inclusive Strategy sets a target of 75% of the adult population to access formal financial services by 2019. By 2019 the level of financial inclusion has been able to reach 76.19%. A significant increase in financial literacy does not accompany an increase in the Indonesian population's financial inclusion level. This problem was then unable to show that financial literacy will be followed by financial inclusion following the Financial Services Authority analysis. It can be assumed that there are still many Indonesians who quickly access and can use financial services but do not have a good understanding and knowledge of these services.

As technology develops and is supported by rapid internet penetration, digital financial services have emerged that make it easier for the public to conduct transactions and financing. This digital financial service is called financial technology, which is then abbreviated as Fintech. Indonesian people use Fintech-based payment services at a 38% percentage and are followed by loan services at 31%. This report shows that the availability of Fintech in Indonesia can help the government provide financial services for payments and loans that are more extensive and efficient. The total value of an investment in Fintech in Indonesia in 2017 reached 2.29 trillion rupiahs (Fintech Indonesia Report, 2018).

This prediction shows the opportunity to develop digital financial services in Indonesia shortly to meet the community's needs. Based on Bank Indonesia's Financial Stability Review (2017), Fintech is considered capable of reaching people who cannot yet be reached by banks. The existence of Fintech aims to make people more comfortable to access financial products, facilitate transactions, and increase financial inclusion. This goal can be achieved with opportunities based on the 2014 Global Index data in the attachment to the National Inclusive Financial Strategy (2016). Only around 36% (thirty-six percent) of the adult population in Indonesia have access to formal financial institutions. Thus, Fintech can target other Indonesian adult population to obtain financial services.

According to the Financial Services Authority (2017), the increasing use of Fintech has become one of the drivers to increase national financial inclusion. According to the Asosiasi Penyelenggara Jasa Internet Indonesia survey (2016),

Indonesian people who have internet penetration have reached 51.8%, which is 132.7 million of Indonesia's 256.2 million population. Thus, digital and internet-based financial services will be straightforward to reach by people in various areas of residence. Supporting OJK's statement, according to the Ministry of PPN (BAPPENAS) in 2017, Fintech is one form of implementation of the National Financial Inclusive Strategy.

The OECD International Network on Financial Education has started a financial literacy survey instrument that can be used with very different backgrounds in various countries (Atkinson & Messy, 2012). This financial literacy survey instrument was updated by the OECD (2016) by adjusting the questions on each instrument to the community's state. Three components of the instrument used to measure the level of respondent's financial literacy are: 1) Financial knowledge, calculated by counting the number of responses or correct answers by each respondent to six or more questions related to knowledge of calculating the time value of money, loan interest, the principle of calculating bank interest, compound interest, risk and profit, the definition of inflation, and diversification; 2) Financial behavior, the calculation is based on respondents' answers from a total score of seven questions that are used to determine the respondent's financial behavior. Questions asked related to prudence before making a purchase, timeliness in paying bills, setting long-term financial goals, saving activities, decisions in choosing financial products, and loans to meet needs; and 3) Financial attitude, measured by calculating the total score of respondents' answers from the three questions given. The question relates to how respondents in their attitude prioritize short-term desires rather than long-term security or make long-term financial plans. Financial literacy will be measured by an index built from answers to a series of questions related to the financial literacy component.

The development of a better Fintech company amid the Indonesian people is expected to realize the achievement of the target level of community inclusion. However, there has not been an analysis of how the level of influence of Fintech in increasing financial inclusion. Therefore, based on the background described, the researcher intends to analyze how the influence of Fintech on community inclusion and whether financial literacy affects financial inclusion. In addition to these two things, the researcher will analyze how the respondents' characteristics affect public financial inclusion.

The Financial Services Authority is determined to realize a sustainable and stable financial system. It is stating that the level of financial inclusion will follow financial literacy. However, the level of public financial literacy is lower than the level of financial inclusion. This problem raises the suspicion that many people use financial services but do not understand and have good knowledge of these services. However, this is not able to increase the financial literacy of the people to be well literate.

METHODS

The literature review takes place to provide a comprehensive overview of the research topic based on local and international corruption issues in the construction sector. This research uses a literature review method. The researcher conducts a series of studies involving various kinds of information originating from literature such as books, encyclopedias, documents, and various theories and ideas that can then be

formulated according to the research objectives. The systematic review of systematic reviews was undertaken to synthesize the impacts of financial inclusion, financial literacy, and financial technology. Thirty systematic reviews were identified. Only full papers were included in the review if they satisfied the following conditions: the author researched a specific case, the author presented a theory, or the author discussed a trend in financial inclusion, financial literacy, and financial technology. For the literature review, the papers which answered the research question were considered adequate. The results of this literature review will be used to investigate financial inclusion, financial literacy, and financial technology, especially in Indonesia.

RESULTS AND DISCUSSION

Financial literacy

Based on Services Authority Regulation Number 76 / POJK.07 / 2016 concerning Increasing financial literacy and inclusion in the financial services sector for consumers and communities, financial literacy is knowledge, skills, beliefs, which influence attitudes and behaviors to improve the quality of decision making and financial management to prosper. The Organization for Economic Co-operation and Development (OECD) (2016) defines financial literacy as knowledge and understanding of financial concepts and risks, along with the skills, motivation, and confidence to apply their knowledge and understanding in order to make effective financial decisions, improve the financial well being of individuals and communities, and participate in the economic field.

According to the OECD/INFE (2015), financial literacy is a combination of awareness, knowledge, skills, attitudes, and behaviors needed to make financial decisions to achieve the ultimate goal of achieving individual financial well-being. According to Welly et al. (2016), financial literacy is the ability of someone in making effective decisions related to finances. Financial literacy helps individuals avoid financial problems, especially those that occur due to financial management errors.

In Kharchenko's research (2011), financial literacy can be summarized as the necessary numerical skills and understanding of basic economic concepts needed for savings and decision making in loans. According to Warsono (2010), everyone needs to achieve financial independence, knowledge, and implementation in carrying out healthy and ideal personal financial practices. Financial literacy is defined as the extent of knowledge and implementation of a person managing his finances.

Previous research conducted by Muat et al. (2014) using literacy level analysis instruments started by Lusardi & Mitchell in 2011. The research aims to examine the level of respondents' understanding of financial literacy and then the effect on applying for a personal loan. This research object's population is permanent lecturers who teach at the Sultan Syarif Kasim Riau State Islamic University (UIN Suska Riau). The results of testing on respondents obtained that financial literacy influences personal loan decisions. Also, some definitions suggest that financial literacy reduces the risk of taking credit or other financing services.

Tsalitsa & Rachmansyah (2016) examined the Financial Literacy Analysis and Demographic Factors on Credit Taking at PT Columbia Kudus Branch. This study states that a person's financial literacy level will influence financial institutions' credit

decisions. Furthermore, with the increasing availability of financial institution services, it will provide convenience to the public. Nevertheless, this must be supported by the concept of personal financial literacy. If it is not supported, then taking credit risk will arise because it merely wants to fulfill desires and lifestyles only, not to meet needs.

Cardinal (2017) examines financial literacy on the use of financial products in Palembang Multi Data STIE students. The research results found that the respondents' financial knowledge was quite good from several predetermined categories. It was concluded that the higher the level of financial literacy, the higher the financial knowledge and would have implications for the level of investment made by respondents. The level of use of financial products as a whole, more students use investments in insurance products and savings in banks. Students still prioritize investment in financial instruments that provide guaranteed security and a stable rate of return.

Nasution et al. (2013), concerning the effect of financial literacy on access to financial services in Kenya in 2009, concluded that access to financial services is not only influenced by the level of financial literacy. The level of Income, distance from the bank, age, marital status, gender, size of the household, and education level have a tremendous influence on the decision to access financial services.

One needs financial freedom, expertise, and execution to achieve safe and optimal personal financial activities. Financial literacy is characterized as a manager's degree of knowledge and implementation. However, the growing availability of financial institution services would provide comfort to the public. Nonetheless, personal financial literacy will help this. Unless it is not sponsored, the likelihood of taking credit risk will occur because it only wants to satisfy desires and habits, not needs. However, the growing availability of financial institution services would provide comfort to the public.

Nonetheless, personal financial literacy will help to achieve financial freedom. If it is not sponsored, the likelihood of taking credit risk will emerge because it only wants to satisfy desires and lifestyles, not meet needs. The level of Income, distance from the bank, age, marital status, gender, household size, and educational level have a considerable impact on the decision to access financial services.

The effect of financial technology on financial inclusion

Hutabarat (2018) explains that the higher the number of people who use digital-based financial services will support the government's achievement of the implementation of financial inclusion. The availability of financial services will be more extensive. It can reach people who previously had difficulty accessing financial products and services—changing the form of services and financial products from conventional to technology-based efficiency and operational costs for the community. Payment products, settlement clearing, peer-to-peer lending, market aggregators, risk, and management can help the public access financial services and products. High internet penetration in the Indonesian people will further increase financial inclusion through the increasingly developing use of financial technology services. This situation is in line with the statement of the Ministry of PPN (BAPPENAS) in 2017; Fintech is one form of implementation of the National Financial Inclusive Strategy. This strategy formulated that the government had reached the Indonesian people's financial inclusion,

76.19% in 2019.

Financial services availability will be full and will reach people who historically had trouble accessing financial products and services — changing the type of services and financial products from traditional to community-based, technology-based performance, and operating costs. Payment products, settlement clearing, peer-to-peer loans, market aggregators, risk, and management can help connect financial services and goods to the public. High internet penetration among Indonesians would further increase financial inclusion by increasing the use of financial technology services.

The gender factor for financial inclusion

The financial inclusion of male sex society was better than that of women. Men use more financial services than women, and the level of men's trust in financial services is better than women (Hutabarat, 2018). This research is also supported by the fact that there are more male workers than women in society. So that financial activities will be mostly done by men. Nugroho (2017), who found that gender did not affect decisions on account ownership, saving, and borrowing informal financial institutions. However, this result was supported by Perpres No. 82 of 2016 concerning the National Inclusive Finance Strategy, which strategy targets the female gender community because of the low level of financial inclusion.

Society has more male staff than women. Male society's financial inclusion was higher than women's. Men use more financial services men's trust in financial services is higher than women. Gender did not affect account ownership decisions, saving and borrowing informal financial institutions—targets strategy targets in the female gender community due to low financial inclusion.

Educational factors on financial inclusion

Hutabarat (2018) states that the higher the last education, the more comprehensive the financial insight and education source. Good financial education will increase public knowledge and awareness about formal financial institutions, financial products, and services, including features, benefits and risks, costs, rights, and obligations, and improve people's financial planning and management skills. These results are consistent with Nugroho's (2017) study, which found that age and education significantly influence account ownership and saving informal institutions. Research by Putro & Nainggolan (2016) found that the latest education was correlated and affected respondents' inclusion in deciding the use of investment products and services.

The higher the academic, the more detailed the financial perspective and knowledge. Effective financial education can improve public knowledge and understanding of formal financial institutions, financial products, and services, including features, advantages and risks, costs, rights, and responsibilities, and strengthen people's financial planning and management skills. Age and education significantly affect transparency. Latest education associated with the participation of respondents in determining the use of investment goods and services

Employment factors for financial inclusion

Angraeni (2014) and Hutabarat (2018), people who work in trade and finance have much knowledge about financial products and services and better utilization. People who have tertiary employment, namely trade, transportation, finance, and services, have better financial inclusion levels than other sectors. Hutabarat (2018) also

states that the most critical financial inclusion is the employment variable. The respondent's occupation will have the most dominant influence on the level of financial inclusion he has. People who have jobs in the tertiary sector will increase the understanding and use of financial products and services.

People with trade and finance knowledge of financial goods and services and their use. Persons with tertiary employment, including commerce, transportation, banking, and services, have higher financial inclusion rates than others. The most critical financial inclusion is employability. People with tertiary employment should improve awareness and use of financial products and services.

Income factors on financial inclusion

Putri & Rahyuda (2017) and Hutabarat's (2018) and Income has no significant effect on inventory decision behavior. That is, one's income level does not become a benchmark for making an individual investment decision or other financial services. In this group of people, despite having a high income, it is not a factor of getting better and trust in financial services. This result is different from Nugroho (2017), Putro, & Nainggolan's (2016) research that Income has a significant effect on influencing account ownership and saving informal institutions and respondents' inclusion in deciding the use of investment products and investment services.

Financial technology

Financial technology is one implementation of information technology related to finance (Alimirruchi, 2017). Professor Douglas W. Arner (in Mawarni 2017) from Hongkok University divided Fintech's development into four eras. Fintech 1.0 took place between 1866-1967, the era of infrastructure development and computerization to form a global financial network. Between 1967-2008, the era Fintech 2.0 of internet use, and digitalization in the financial sector. Fintech 3.0 and Fintech 3.5 take place from 2008 until now. Fintech 3.0 is the era of telephone and smartphone use in the financial sector. Fintech 3.5 is an era in which the emergence of a financial technology business emerges as a newcomer who takes advantage of technological process innovations, products, and business models and changes in people's behavior. Bank Indonesia (2016) classifies financial technology into four categories, as follows:

1. Crowdfunding and peer-to-peer (P2P) lending; This classification is based on the platform's function as a means of meeting capital seekers and investors in the loans field. This platform uses information technology, especially the internet, to provide accessible loan services. Capital providers only provide capital, and the borrower makes the loan process through an online platform. This financial technology category includes lending and borrowing services based on information technology that is regulated and supervised by the Financial Services Authority (OJK). To guarantee the security of using crowdfunding and P2P lending services in Indonesia, in 2016, OJK issued POJK No. 77/POJK.01/2016 concerning Information Technology-Based Lending and Borrowing Services.
2. Market aggregator; This category is a media that collects and collects financial data from various data providers to be presented to users. This financial data can then be used to facilitate users in comparing and choosing the best financial products.
3. Risk and investment management; The following categories are classifications for financial technology services that function as financial planners in digital form. So,

users can plan and know the financial condition at any time and all circumstances.

4. Payment, settlement, and clearing; Financial technology services in this category function to facilitate users in making payments online quickly. Fintech is under the supervision of Bank Indonesia. In 2016, Bank Indonesia issued Bank Indonesia Regulation Number 18/40/PBI/2016 concerning the Processing of Payment Transactions. This regulation aims to continue to support the creation of a smooth, safe, efficient and reliable payment system by prioritizing the fulfillment of the principle of prudence and adequate risk management and by taking into account the expansion of access, national interests, and consumer protection, including international standards and practices.

Financial inclusion

Bank Indonesia (2014) defines financial inclusion as all efforts to eliminate all forms of price and non-price barriers to public access in utilizing financial services. Indicators that can measure a country's financial inclusiveness are availability or access to measure the ability to use formal financial services in real affordability and prices. Then indicators can use to measure the ability to use actual financial products and services, quality to measure whether the attributes of financial products and services meet customer needs, and welfare to measure the impact of financial services on the level of life of service users. The Financial Services Authority (2016) defines financial inclusion as the availability of access to various financial institutions, products, and services following the community's needs and abilities to improve its welfare. Based on the Financial Services Authority Regulation No. 76/POJK.07/2016 regarding increasing financial literacy and inclusion in the financial services sector for consumers and the public, the objectives of financial inclusion include a) Increased public access to financial services institutions, products, and services; b) Increased supply of financial products and services by financial service businesses per the community's needs and abilities of the community; c) Increased use of financial products and services under the needs and abilities of the community; and d) Increasing the quality of the use of financial products and services according to the community's needs and abilities.

The objectives of financial inclusion mentioned above can be achieved with the National Financial Inclusion Strategy prepared by the government. Based on the Republic of Indonesia Presidential Regulation No. 82 of 2016 concerning the National Strategy for Inclusive Finance (*Strategi Nasional Keuangan Inklusif*), inclusive financial policies include National Strategy For Inclusive Finance pillars and foundations supported by coordination between relevant ministries/institutions or agencies and complemented by inclusive financial actions. The following are the pillars and foundations of National Strategy For Inclusive Finance:

1. Financial education pillars; Financial education aims to increase public knowledge and awareness about formal financial institutions, financial products, and services, including features, benefits and risks, costs, rights, and obligations, and improve people's financial planning and management skills.
2. Pillars of community property rights; aim to improve public credit access to formal financial institutions.
3. Pillars of intermediation facilities and commercial distribution channels; Intermediary facilities and financial distribution channels aim to expand the reach of financial

services to meet various community groups' needs.

4. Pillars of financial services in the government sector; Financial Services in the government sector aims to improve governance and transparency of public services in government funds' non-cash distribution.
5. The pillar of consumer protection Consumer; protection aims to provide security to the public in interacting with financial institutions, as well as having the principles of transparency, fair treatment, reliability, confidentiality, and security of consumer data/information, handling complaints, and settling consumer disputes simply, quickly, and affordable costs.
6. Active organization and implementation mechanism; The diversity of inclusive financial actors requires organizations and mechanisms to encourage the implementation of various activities and integration.

Effect of financial literacy on financial inclusion

Hutabarat (2018) shows that financial literacy has a positive and partially significant effect on financial inclusion. Financial literacy has three components, namely, financial knowledge, financial behavior, and financial attitudes. These three components have a positive influence on financial inclusion. This research shows that the higher the financial knowledge, the better the financial behavior and financial attitude of a person will increase the use, utilization, and understanding of financial products and services.

The available financial products and services can improve the community's economic welfare by managing and utilizing their finances. These results are consistent with Andrew & Linawati's (2014) study, which suggests that financial knowledge variables have a positive and significant influence on personal financial management dimensions. In this study, the results showed that the better the financial knowledge of a person, the better the personal financial management behavior in society.

Putri & Rahyuda (2017) explained that financial literacy has a significant positive effect on individual investment decisions' behavior. The higher the level of financial literacy, the better the behavior of individual investment decisions. Research by Tsalitsa & Rahmansyah (2016) found that the research results that the amount of financial literacy affects credit taking. Lusardi & Mitchell (2007) state that an adequate financial literacy level will encourage a person to make plans, including anticipating retirement planning with investments from a productive age. This result is supported by Atkinson & Messy (2012) that the way a person behaves in financial literacy has a significant impact on financial performance and the selection of personal financial services. It is, therefore, essential to analyze evidence of behavior in terms of financial literacy.

People who understand the time value of money, interest on loans, interest on deposits and compounds, the rate of return and investment risk, the definition of inflation, and diversification will be better able to appropriately use financial products and services. In addition to using it well, the public can also choose financial products and services that suit their needs and abilities. Communities that have done household financial budgeting, conduct personal financial supervision, have long-term targets, and are careful in making financial decisions have better financial inclusion rates.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

Financial literacy consists of three components, namely, financial knowledge, financial behavior, and financial attitudes. The theory states that the level of financial inclusion will follow the level of financial literacy. This conclusion is not by reality in society, where financial literacy is still shallow compared to financial inclusion. It can be concluded, there are still many people who use financial products and services without having a good knowledge of the functions, how to choose the right according to needs, and do not know the risks of the products used.

Recommendations

Until now, the Financial Services Authority and Bank Indonesia have done much education about financial terms, the benefits of each financial product and service, and financial management for business actors in the tertiary sector, especially SME entrepreneurs. Based on the above study results, it is known that gender, age, education, and occupation have a real influence on financial inclusion. This recommendation means that in increasing financial inclusion, a strategy evaluation of the respondents' characteristics is needed.

REFERENCES

Alimirruchi, W. (2017). Analyzing operational and financial performance on the financial technology (Fintech) firm. *Project Report*, Universitas Diponegoro.

Andrew, V., & Linawati, N. (2014). Hubungan Faktor Demografi Dan Pengetahuan Keuangan Dengan Perilaku Keuangan Karyawan Swasta di Surabaya. *Finesta*. 2(2), 35-39.

Anggraeni, B. (2014). Pengaruh tingkat literasi keuangan pemilik usaha terhadap pengelolaan keuangan. *Jurnal Vokasi Indonesia*. 3(1), 22-30.

Asosiasi Penyelenggara Jasa Internet Indonesia. (2016*). Infografis Penetrasi dan Perilaku Pengguna Internet Indonesia Survey 2016*. Available at: https://apjii.or.id/.../file/BULETINAPJIIEDISI05November2016.pdf

Atkinson, A., & Messy F. (2012). Measuring financial literacy: results of the OECD / International Network on Financial Education (INFE) pilot study. *Organization for Economic Cooperation and Development*. 15.

Bank Indonesia. (2014). *Booklet Keuangan Inklusif*. Jakarta: Bank Indonesia.

Bank Indonesia. (2017). *Kajian Stabilitas Keuangan*. Jakarta: Bank Indonesia.

Bank Indonesia. (2016). *Rancangan Peraturan Bank Indonesia tentang Penyelenggaraan Pemrosesan Transaksi Pembayaran*. Jakarta: Bank Indonesia.

Hutabarat, F., (2018). Pengaruh Literasi Keuangan Dan Financial Technology Terhadap Inklusi Keuangan Pada Masyarakat Jabodetabek. *Project Report*. Institut Pertanian Bogor.

Kardinal. (2017). Pengaruh literasi keuangan terhadap penggunaan produk keuangan pada mahasiswa STIE Multi Data Palembang. *Jurnal Ilmiah STIE MDP*. 7(1), 55-64.

Kharchenko, O. (2011). *Financial literacy in Ukraine: determinants and implications for saving behavior*. (Master Thesis). Ukraine: Kyiv School of Economics

Lestari, S. (2015). Literasi keuangan serta penggunaan produk dan jasa Lembaga

keuangan. *Jurnal Fokus Bisnis*, 14 (02), 14-24.

Lusardi, A., & Mitchell, O. (2007). Financial literacy and retirement preparedness: evidence and implicants for financial education. *Journal of National Association for Business Economics*. 42(1), 35-44.

Organization for Economic Cooperation Development. (2016). *Measuring Financial Literacy: Questionnaire and Guidance Notes for Conducting an Internationally Comparable Survey of Financial Literacy*. INFE.

Otoritas Jasa Keuangan. (2016). *Salinan Peraturan Otoritas Jasa Keuangan tentang Layanan Pinjam Meminjam Uang Berbasis Teknologi Informasi*. Jakarta: OJK.

Otoritas Jasa Keuangan. (2016). *Rancangan Peraturan Otoritas Jasa Keuangan tentang Peningkatan Literasi dan Inklusi Keuangan di Sektor Jasa Keuangan untuk konsumen dan/atau, masyarakat*. Jakarta: OJK.

Otoritas Jasa Keuangan. (2016). *Survei Nasional Literasi dan Keuangan Inklusi Keuangan 2016*. Jakarta: OJK.

Otoritas Jasa Keuangan. (2017). *Revisit Strategi Nasional Literasi Keuangan Indonesia*. Jakarta: OJK.

Otoritas Jasa Keuangan. (2017). *Kuliah Umum tentang Financial Technology di Indonesia*. Jakarta: OJK.

Otoritas Jasa Keuangan. (2019). *Survei Nasional Literasi dan Keuangan Inklusi Keuangan 2019*. Jakarta: OJK.

Mawarni, I. (2017). Analisis persepsi masyarakat pengguna layanan transaksi digital pada financial technology. *Project Report*. Universitas Telkom.

Muat, S., Miftah, D., & Wulandari, H. (2014). Analisis tingkat literasi keuangan dan dampaknya terhadap keputusan pinjaman pribadi. *Economics & Business Research Festival*. Universitas Kristen Satya Wacana. 465-478.

Nasution, L.,N., Sari, P., & Dwilita, H., (2013). *Determinan keuangan inklusif di Sumatera Utara, Indonesia*. 14 (1), 58-66.

Nugroho, A., (2017). Analisis determinan inklusi keuangan di Indonesia. *Project Report*. Universitas Diponegoro.

Presiden Republik Indonesia. (2016). *Peraturan Pemerintah Republik Indonesia Nomor 82 Tahun 2016 tentang Strategi Nasional Keuangan Inklusif*. Available at: http://peraturan.go.id/perpres/nomor-82-tahun-2016.html.

Putri, N., & Rahyuda, H. (2017). Pengaruh tingkat financial literacy dan faktor sosiodemografi terhadap perilaku keputusan investasi individu. *E-jurnal Ekonomi dan Bisnis Universitas Udayana*. 6(9), 3407-3434.

Putro, L., & Nainggolan, Y. (2016). Investment inclusion among Indonesia online community. *Journal of Business and Management*. 5(4), 597-603.

Tsalitsa, A., & Rachmansyah, Y. (2017). Analisis pengaruh literasi keuangan dan faktor demografi terhadap pengambilan kredit pada pt. columbia cabang kudus. *Media Ekonomi dan Manajemen*. 31(01),1-13

Vuthalova, M. (2015). Pengaruh pengalaman berinvestasi terhadap literasi keuangan dan keputusan investasi. *Project Report*. Institut Pertanian Bogor.

Warsono. (2010). Prinsip-prinsip dan praktik keuangan pribadi. *Jurnal Salam*. 13(02), 137-151.

Welly, Kardinal, & Juwita, R. (2016). Analisis Pengaruh Literasi Keuangan Terhadap Keputusan Investasi di STIE Multi Data Palembang. *Project Report*. STIE Multi

Data Palembang.

Xu, L, & Bilal, Z. (2012). *Financial literacy around the world – an overview of the evidence with practical suggestions for the way forward*. The World Bank.

Finance and Private Sector Development. Policy Research. *Working Paper*. 6107: 1-58.e

The causality among e-money, manufacturing, services and money supply: an empirical evidence of ASEAN countries

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Abstract

The economic transition happened in ASEAN countries caused the increased growth of e-money use. This study was established to discover the causal relation between the growth in manufacturing and service sector and the e-money usage through causality panel approach. Furthermore, this study also focused on finding the causality among the economic growth in manufacturing and service sector, e-money and money supply during 2008-2018 period in the region. The result of the study showed that: (1) there was a one-way causality between the growth in service sector and e-money use, (2) there was no causality between e-money use and the growth in manufacturing sector (3) the growth of money supply provided causal effect on the increase of e-money use.

Keywords: *E-money, Manufacturing sector, Money supply, Service sector*

JEL Classification: E5, E51, O42

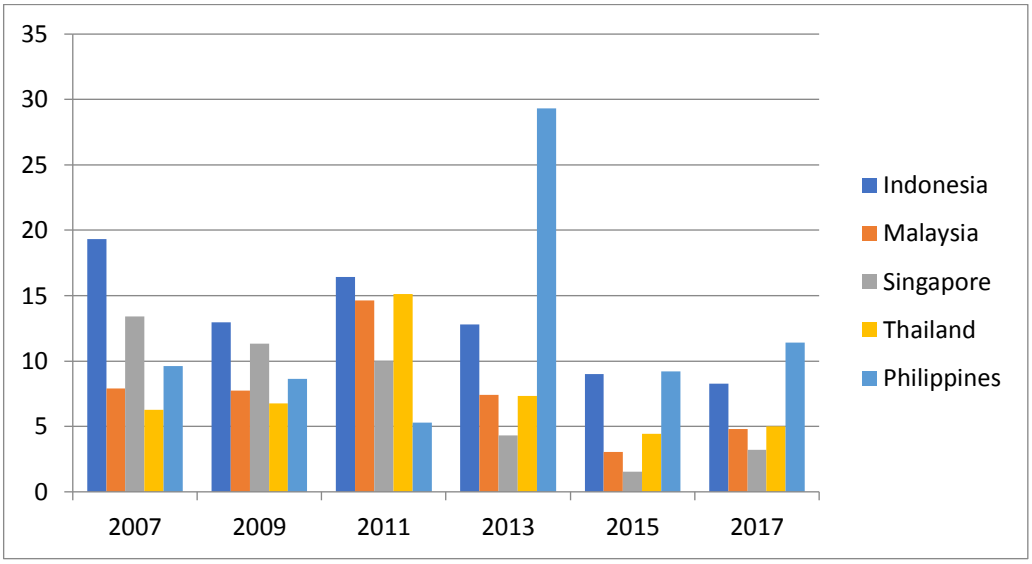
INTRODUCTION

Money is any item or verifiable record that is generally accepted as payment for goods and services. In addition, the main functions of money are distinguished as: a medium of exchange and an installment of fee. Therefore, it can be generally acknowledged as a means of payment (Palley, 1999). However, as the economy developed, money whose function was initially as a means of payment grew into a unit of account and medium of storing wealth. Money as the economic institution served to improve human's ability to allocate economic resources (Abdulrazag et al. 2001). Its fuctions as an installment of fee, a deposit of value, a standard of value and a standard of payment will help humans improve the economic resource allocation efficiency which will then enhance their quality of life.

As the role of bank developed in the economy, the use of banknotes would declined and then be left behind. Public would prefer to save their money in the bank and deposit them into a saving account or current account because it was safer and more convinient (Bodeiono, 2002).

The Figure 1 displayed that the money supply in five ASEAN countries fluctuated significantly. When a crisis hit the region, there was a weakening in financial market and capital market causing a decline on macroeconomic variables in those countries. In the

same year, Indonesia had ratified their Sharia banking Act. The money supply in Malaysia either banknotes, M1 or M2 experienced a favorable growth.



Source: World Bank, 2018

Figure 1. The comparison of money supply in Indonesia and other ASEAN countries

Many factors affected the ups and downs of money supply in Indonesia both in narrow sense (M1) and broader sense (M2) such as credit interest rate, inflation rate, investment, government spending and foreign exchange reserves.

According to Marshall, the level of income influenced the money supply or the demand of money by the community or individuals as the owner of the wealth. In addition, that credit interest rate also provided impact on money supply and explained that speculation and the desire to speculate from individuals would cause the increase of money supply.

Indonesia, Malaysia, Singapore, Thailand and the Philippines are the countries that embrace an open economy. Cooperation between countries are established through export and import activities which require payment method that have an adequate price. In that case, the stability of currency value could affect the money supply. Also, the modernization of the economy caused changes in e-money usage. The more we use e-money, the less money supply there would be (Mankiw, 2009).

An excessive increase in the money supply could push up prices beyond the expected level and would cause an increase of inflation. As the result, the economic growth would be disrupted in the long run. On the other hand, if an increase in the money supply was too small, the economic downturn would occur. Consequently, the overall prosperity of the community would decline. These conditions motivated the government and monetary authorities to conduct efforts in controlling the money supply. This activity of controlling the money supply was commonly called monetary policy, an integral part of macroeconomic policy pursued by the monetary authority (Bank Indonesia, 2003).

The fluctuation of the money supply and the transformation of the economic structure in ASEAN countries resulted in this study that examines the causality among e-money, manufacturing, services and money supply.

LITERATURE REVIEW

The strength of the platform business model has grown as our economy becomes progressively digital, but it also rises an uncertainty in the market. Therefore, how

industry and services react to overcome the challenges from the platform business model growth is essential. According to Jocevski et al. (2019), mobile payment is one of the strategies in the future digital transition to overcome uncertain market conditions, especially in industries and services. Modernization provided convenience in an economic activity. The movement of e-money is inseparable from the appearance of *fintech* as a new method of payment. The presence of this new industry has become an innovation in increasing industry and service growth. Milian et al., (2019) mentioned that *fintech* was a financial industry utilizing the communication availability, internet, and automatic information processing, which was closely related to economic activity, especially in the industrial and service sectors.

A regional economic growth provides a positive influence on changes in financial institutions and the economic growth and money supply have a very strong integration. In line with that, Campos et al. (2019) found out that European integration stimulated the economic growth in the region. The economic implementation in the digital transition can be seen from the Bitcoin trend as a substitute for traditional payment method. Schilling & Uhlig (2019) explained that Bitcoin money offer grew significantly with a simpler and more efficient use. In addition, e-money provided convenience in transactions (Wulandari et al., 2016). Several literature studies proved that e-money becoming a payment substitute gave benefits, especially in the service and industry sectors (Kok, 2002; Athanassiou & Mas-Guix, 2008).

Dragos et al. (2002) stated that the economies depend on each other. Their article presented a different statistical approach in analyzing the effects of money supply and inflation rates. Different monetary policies adopted by China and the United States could be a starting point in estimating inflation using data in the past and analyzing monetary policies adopted throughout the year. The model created would present different applications in China and the United States as China's economy was influenced by its political sector and unhealthy growth in money supply.

Lestari (2008) analyzed the impact of rupiah exchange rate instability on M2 money demand in Indonesia. The variables used were money demand (M2) as the dependent variables, with inflation, market interest rates, the exchange rate and real national income as the independent variables. The analysis used 4 (four) estimation methods; Vector Auto-Regression (VAR), impulse response functions test, variance decomposition test and ADL ECM model test. The research found that there was a non-stationarity condition for time series data making macroeconomic stability difficult to achieve. Then, it took three quarters to adjust the balance between variables, and no two-way causality relationship was found for all variables. On the other hand, the M2 impulse response to the independent variable fluctuated, especially when the independent variable experienced a shock, but it could return to stable. Then, the exchange rate and M2 (money supply) relationship depended on the expectation of the money holders; therefore it was difficult to maintain a stable relationship between the exchange rate and money supply. Indonesians tend to believe that holding cash was not for transaction, but rather for precaution and speculation.

Lintangsari et al. (2011) conducted research to analyze the effect of non-cash payment methods on financial system stability in Indonesia. E-money and credit card transaction provided positive and significant influence on money supply. On the other hand, e-money transactions gave a negative effect on interest rates. However, credit card transaction had a significant and positive effect on interest rates.

Ritonga (2005) also conducted research on the effects of non-cash payment on economic growth in Indonesia. The results of the study showed that debit cards, credit

cards, and e-money had positive and significant effects on the money supply. The debit card had a significant positive effect on economic growth, but credit card had a negative effect on economic growth. Furthermore, e-money gave insignificant positive effect on economic growth, and the money supply had a positive but insignificant effect on economic growth. The analysis results showed that debit cards directly provided a positive influence on economic growth with the money supply as an intervening variable. Next, the credit card and e-money indirectly had a positive effect on economic growth with the money supply as an intervening variable.

METHODS

This study focused on determining the causality between economic growth in the manufacturing and service sectors, e-money and the money supply. The data used in this study were the time series data during 2008-2018 in the ASEAN Region. The data were obtained from the official website of the World Bank which included data on world development indicators and on the banking websites from the respective ASEAN countries. The details could be seen in Table 1.

Table 1. Variable description

Variable		Variable Description
Manufacturing	MF	The economic growth in manufacturing sector during 2008-2018 in ASEAN (in %)
Service	SC	The economic growth in service sector during 2008-2018 in ASEAN (in %)
E-money	E	e-money during 2008-2018 in ASEAN (in USD)
Money Supply	M2	The money supply during 2008-2018 in ASEAN (in USD)

The study applied the dynamic relationship model with the Granger causality vector error correction model (VECM) with the following models:

1. The estimation model of manufacturing model with e-money

$$EM_{it} = a_i + \sum_{1i} \beta\, MF_{it-1} + \sum_{1i} EM_{it-1} + \varepsilon_{1it} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 3.1$$

$$MF_{it} = a_{2i} + \sum_{2it} \beta\, MF_{it-1} + \sum_{2i} EM_{it-1} + \varepsilon_{2it} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 3.2$$

2. The estimation model of service growth with e-money

$$EM_{it} = a_i + \sum_{1it} \beta\, SV_{it-1} + \sum_{1i} EM_{it-1} + \varepsilon_{1it} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 3.3$$

$$SV_{it} = a_{2i} + \sum_{2it} \beta\, SV_{it-1} + \sum_{2i} EM_{it-1} + \varepsilon_{2it} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 3.4$$

3. The estimation model of money supply (M2) with e-Money

$$EM_{it} = a_{it} + \sum_{1it} \beta\, M2_{it-1} + \sum_{1i} EM_{it-1} + \varepsilon_{1it} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 3.5$$

$$M2_{it} = a_{2it} + \sum_{2it} \beta\, M2_{it-1} + \sum_{2i} EM_{it-1} + \varepsilon_{2it} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 3.6$$

Note: *EM= E-Money ; MF= Manufacturing Growth ; SV= Service Growth ; M2=Money Supply;* i*= ASEAN countries* i*= 2008-2018* $t-1$*= Lag.*

Before estimating VEC Granger causality model, several steps must be undergone such as testing stationary data with the unit root test, the im-pesaran-shin test (Pesaran et al., 2000) and Johansen co-integration test (Al-Sadoon, 2019).

RESULTS AND DISCUSSION

Descriptive analysis

Trends in the money supply, economic growth in the service sector and manufacturing in ASEAN countries are descriptively presented in Figure 2:

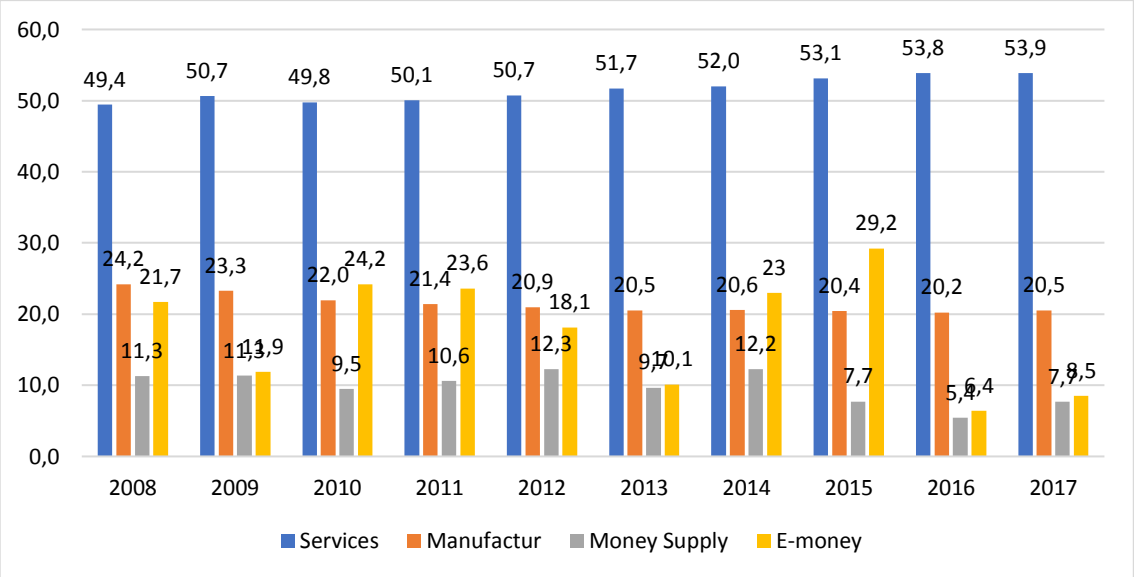


Figure 2. The money supply, economic growth in the service sector and manufacturing trend in ASEAN countries in the 2008-2017 period.

The trend of manufacturing growth has fluctuated descriptively during the 2008-2017 period in ASEAN countries. In line with this, the condition of the money supply and e-money fluctuates descriptively. However, in contrast to the growth in the service sector, which experienced an increase in general during the same period, the conditions indicate that there has been a transformation of the economic structure from the industrial sector to the service sector.

Causality analysis

This research was conducted to discover the causality between economic growth in the manufacturing and service sectors, e-money and money supply. There were several testing steps conducted; stationary test, unit root test, im-pesaran-shin test (Pesar et al., 2000), optimal lag test, and Johansen's co-integration test (Al-Sadoon, 2019). The first phase was the stationary test and im-pesaran-shin test and the result could be seen in Table 2

Table 2. Unit root panel first difference test

Series	t-Stat	Prob.
D(MANUFACTURING)	5.5910	0.0000
D(SERVICE)	3.3014	0.0005
D(E-MONEY)	4.6820	0.0000
D(M2)	1.6608	0.0484

Table 2 shows the results of unit root test at the first difference level. The results of economic growth in the manufacturing and service sectors, e-money and the stationary money supply at the first difference level are indicated by the probability value of im-pesaran-shin test which is smaller than the level of significance (1%, 5% and 10%). Thus,

this variable could be used to estimate the Granger causality panel with a vector error correction model (VECM).

Kao Residual Cointegration Test was conducted to determine the long-term relationship between the variables studied. Table 4 shows that the t-statistic probability which is smaller than the level of significance (1%, 5% and 10%) indicates a long-term relationship or a cointegration in the equation model.

Table 3. Kao residual cointegration test

ADF	t-Statistic	Prob.
	-3.326278	0.0004
Residual variance	0.477957	
HAC variance	0.647404	

VECM estimation result shows that e-money had a one-way correlation with service growth and money supply. In another word, e-money stimulated the growth of services and the money supply, but not otherwise. The service growth and money supply did not trigger the development of e-money. On the other hand, manufacturing and e-money did not have a causality relationship. It meant that the increase in e-money use provided no impacts on the manufacturing industry. Simply put, the economic growth in ASEAN experienced a transition from industrial-based sector to service-based sector. The result was in line with the studies from Dragos et al. (2002), Lestari (2008) and Hariani et al. (2012). In conclusion, e-money had a correlation with the economic growth, as it was also stated by Chowdurry (2012) and Kartika et al (2014) in their studies.

Table 5. Causality Granger Test

Null Hypothesis:	Obs	F-Statistic	Prob.
E-money does not Granger Cause Manufacturing	45	0.51760	0.5999
Manufacturing does not Granger Cause E-money		0.40515	0.6696
Services does not Granger Cause E-money	45	3.20003	0.00291
E-money does not Granger Cause Services		1.45044	0.2458
E-money does not Granger Cause M2	45	2.89122	0.0957
M2 does not Granger Cause E-money		0.35941	0.5517

The findings of this study indicate that statistically e-money would grow when it is used as an electronic payment method in service-based sector. On the other hand, the growth of the manufacturing industry did not give a causal effect on e-money. Hence, transition from industrial sector to service sector stimulated e-money to expand. The use of e-money would increase as the service-based sector grew. An advance in technology led to changes in dominant sectors in the ASEAN economic growth.

Findings in this study show the transformation of economic structures in ASEAN countries from the manufacturing sector to the services. This situation resulted in a change in the use of e-money, in an effective trend of the use of e-money with the existence of digitization in the service sector impacts on the condition of the money supply.

CONCLUSIONS AND RECOMMENDATIONS

Conclusion

This study analyzed the causality between the economic growth in manufacturing and services, e-money and money supply which results show that there was a one-way causality between e-money with service growth and the money supply. The impact of e-money would empirically determine the growth of services and the use of e-money. Thus, the raise of digitization especially the increase of e-money would affect the service sector

and the growth of the money supply. In other word, e-money did not have any impacts on the manufacturing industry in ASEAN. The economic implication was that the growth of service sector would encourage e-money. It means that money substitution occurred when manufacturing growth existed. Changes in the economic structure from manufacturing industry to services led to more massive use of electronic money. Therefore, the monetary regulation should be developed to respond the growth of e-money as a means of payment in the future.

Recommendations

Policy recommendations must be established. Given the increasing and unpredictable digital growth trend, it is necessary to control the use of e-money especially in the service sector so that the stability of the money supply is achieved. In addition, further studies are needed taking e-money and digitization as important aspects in determining the supply of modern money.

REFERENCES

Al-Sadoon, M. M. (2019). Testing subspace Granger causality. *Econometrics and Statistics*, *9*, 42–61. https://doi.org/10.1016/j.ecosta.2017.08.003

Athanassiou, P., & Mas-Guix, N. (2008). *Electronic money institutions - current trends, regulatory issues and future prospects*. ECB Legal Working Paper Series, 7.

Bank Indonesia.(2018). *Data Uang Elektronik di Indonesia Periode 2008-2018*. Retrieved from BI.go.id

Boediono.(2009). *Ekonomi Moneter.* Yogyakarta: BPFE Yogyakarta

Chowdhury, I. & Schabert, A. (2003). *Money Supply Rules*. University of Cologne, Department of Economics, 50923 Koeln, Germany.

Campos, N. F., Coricelli, F, & Moretti, L. (2019). Institutional integration and economic growth in Europe. *Journal of Monetary Economics*, *103*, 88–104. https://doi.org/10.1016/j.jmoneco.2018.08.001

Dragos, P., Mihaela, S., & Stefan, M. (2013).The Influence of Money Supply and Interest Rate on Inflation. *China-USA Business Review*, 12 (6), 543-551

Hariani R.S.P. (2012). Faktor-Faktor yang Mempengaruhi Jumlah Uang Beredar di Indonesia Periode 1990-2010. *Jurnal Ekonomi Kawan*, 14 (2), 99-109

Jocevski, M., Ghezzi, A., & Arvidsson, N. (2019). Exploring The Growth Challenge Of mobile Payment Platforms: A business Model Perspective. *Electronic Commerce Research and Applications*, 40, 1-13. https://doi.org/10.1016/j.elerap.2019.100908

Kartika,V.T. Nugroho, A.B. (2015). Analysis On Electronic Money Transactions On Velocity Of Money In Asean-5 Countries. *Journal of Business and Management*, 4 (9), 1008-1020.

Kok, L. S. (2002). Singapore Electronic Legal Tender (SELT) – A proposed concept. *The Future of Money*, 147–155.

Lestari, E.P. (2008). Dampak Ketidakstabilan Nilai Tukar Rupiah Terhadap Permintaan Uang M2 di Indonesia. *Jurnal Ekonomi Pembangunan* , 9 (2), 121-136.

Milian, E. Z., Spinola, M. de M., & Carvalho, M. M. d. (2019). Fintechs: A literature review and research agenda. *Electronic Commerce Research and Applications*, *34*. https://doi.org/10.1016/j.elerap.2019.100833

Palley, T.I. (1993).C*ompeting Views of the Money Supply Process: Theory and Evidence*. Dept. of Economics New School for Social Research New York, NY 10003

Pesaran, M. H., Shin, Y., & Smith, R. J. (2000). Structural analysis of vector error correction models with exogenous I(1) variables. *Journal of Econometrics*, 97(2), 293–343. https://doi.org/10.1016/S0304-4076(99)00073-1

Schilling, L., & Uhlig, H. (2019). Some simple bitcoin economics. *Journal of Monetary Economics*, *106*, 16–26. https://doi.org/10.1016/j.jmoneco.2019.07.002

Wulandari, D., Soseco, T., & Narmaditya, B. S. (2016). Analysis of the Use of Electronic Money in Efforts to Support the Less Cash Society. *International Finance and Banking*, *3*(1), 1.https://doi.org/10.5296/ifb.v3i1.8802

Contributing factors of labor productivity in the industrial sector in Indonesia: a comparative study among regions

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Abstract
Indonesia's degree of competitiveness in attracting investment is relatively low compared to other ASEAN countries, e.g., Singapore, Malaysia, Thailand, and Vietnam, despite the country's potential resources. Specifically, low labour productivity in industrial sector led to lower degree of investment competitiveness in Indonesia. Thus, this study aims to examine the transformation of economic structures and factors determining the regional labor productivity in industrial sector in Indonesia. This study employs multiple regression method with panel data approach on 34 provinces in Indonesia from 2014 to 2019. This study suggests that, in general, the decline of agriculture sector share in the Eastern part of Indonesia was greater than the Western part of Indonesia. Furthermore, the composition of labor absorption in Sulawesi, Maluku, Papua, and Kalimantan decline periodically. This research also suggests that the factors leading to improvement of productivity in the Industrial sector in Western part of Indonesia is real wages. Moreover, provision of electricity is the contributing factor and hampers labor productivity in the Eastern part of Indonesia. This study further concluded that supply of electricity is substitutional to labor which result in the decline of productivity.

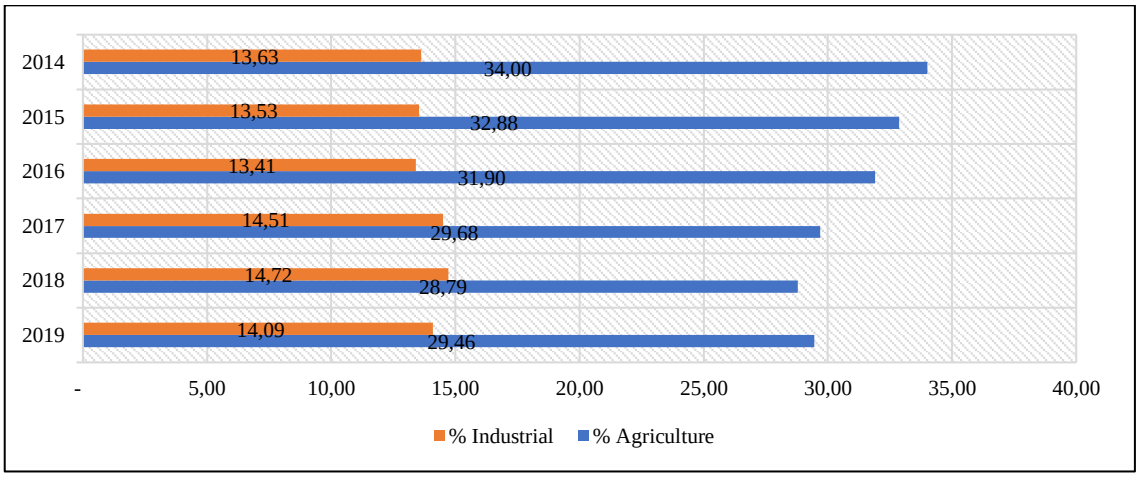
Keywords: *Contributing factors, Labor productivity, Industrial sector*

JEL Classification: C23, H75, J01, J24

INTRODUCTION

Industrial sector's contribution on Indonesia's gross domestic product (GDP) has weakened from 21.02 percent in 2014 to 19.70 percent in 2019. Such phenomenon occurs due to declining total exports of the non-oil and gas, industry, and mining sector exports. Non-oil and gas exports contributed US$ 146 billion out of US$ 176 million in 2014, which decreased by US$ 141.7 billion out of US$ 153.1 million in 2019. The industrial sector contributed US$ 117.3 million in 2014 and decreased to 115.7 million in 2019. Such decrease indicates problems of productivity, crisis, uncertainty of global demands, and volatile exchange rates. Thus, addressing the issue of industrial sector's development is important in Indonesia.

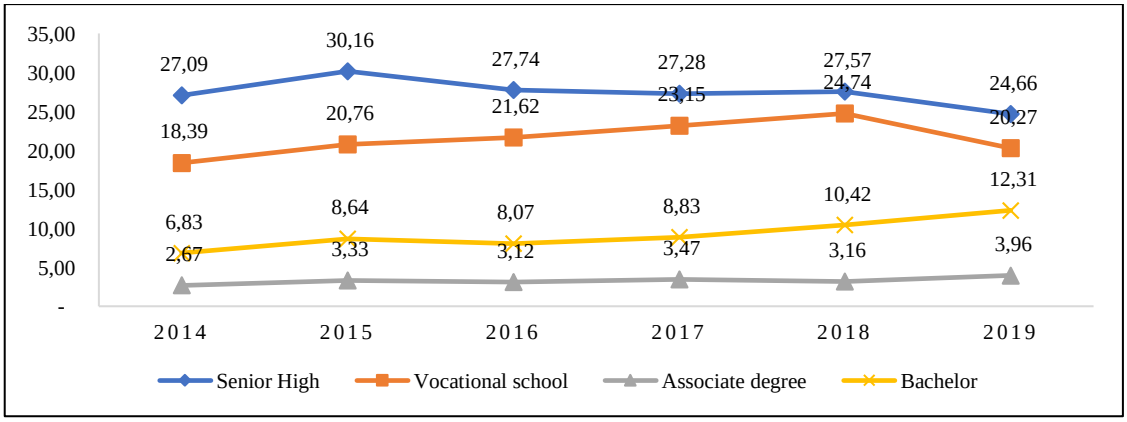
Despite highest contribution to total GDP, labour absorption in industrial sector in Indonesia is relatively low compared to the agricultural sector. In opposition with findings of Chenery & Syrquin (1975), increasing role of industrial sector in Indonesia is not followed by the transition of labour absorption from agriculture sector to industrial sector as shown in Figure 1. Furthermore, production transformation and physical and capital accumulation in industrial sector appears to disregard the shift in structure of labor in Indonesia. As evident in Figure 1, the shift of labor structure appears to be notoriously slow.



Source: Statistics Indonesia (2020)

Figure 1. Comparison of the proportion of labor in agricultural sector and industrial sector in Indonesia, 2014 - 2019

Figure 1 shows that the labor absorption in agriculture sector reached 34 percent in 2014, while the percentage of labor absorption in industrial sector reached 13.63 percent. In 2019, the percentage of labor absorption in agriculture sector relatively declined to 29.46 percent, while industrial sector absorp 14.09 percent of labor. The increase of percentage of labor in industrial sector was found insignificant compared to the decrease of labor in the agriculture sector. Furthermore, labor's level of education revealed that 73.36 percent of labor in the agriculture sector were elementary school graduates, while 57.94 percent of labor were secondary school graduates. Comparatively, the educational background in the two sectors shows that the labor in industrial sector have higher productivity rate. However, the absorption rate of labor in the industrial sector is relatively slow.



Source: Statistics Indonesia (2020)

Figure 2. The development of open unemployment rate based on the education level, 2014 - 2019

Lower absorption rate of labor in industrial sector induces increase of educated unemployment in Indonesia. Figure 2 reveals the decline of unemployment rate for senior high school graduates, while unemployment rate of university graduates increases since 2014. Such phenomenon indicates lower productivity rate of industrial sector in Indonesia. However, recent literature provided debates regarding the association between unemployment rate and productivity. Bräuningera & Pannenberg (2002) suggested that long-term productivity rate tends to decline with increasing unemployment rate, since employment opportunities in the formal sector is relatively low. On the contrary, the study of Amassoma & Nwosa (2013) in Niger has pointed out that the unemployment rate is insignificant to productivity growth. Accordingly, we found gap in perceiving the correlation between unemployment and productivity in existing literature. Thus, to fill in the gap in recent literature, examining the association between unemployment and productivity is important.

Furthermore, recent literature argued that lower productivity rate induced lower competitiveness rate on investment. In fact, investment and productivity specifically correlates, as it is proposed by findings of by Holman, Joyeux, & Kask (2008). The study emphasized that investment and labor productivity are main factors in boosting the quality of the industrial sector. As a result, the market of the industrial sector will boost productivity at the workplace. Zhu & Tan (2001) further confirm the main idea by investigating the feedback effect between the FDI intensity per capita and labor productivity in China. Thereby, the productivity of labor has become a primary concern to accelerate economic growth. Thus, improving labor productivity rate is important in inducing higher competitiveness rate in investment, which further accelerate economic growth in the long term.

Accelerating productivity relies on the internal factor of labor, such as education, health, and work hour. Improvement of labor productivity is inseparable from the increase of education and health level. Education and health became determining factors in stimulating productivity. Quantity and quality of education and health is considerably significant in actualizing labor productivity (Rangazas, 2002; McCuney, 2001; Dollard & Neser, 2013). Recent literature also shows that improvement of education and health results in higher demand in labor market which further indicates increasing productivity rate (Aísa, Pueyo, & Sanso, 2011). Additionally, work hour also contributes in increasing productivity (Soekimana et al., 2011).

Moreover, in many industrial countries, such as South Korea, investing in human capital has been the priority, and it is proven effective to stimulate productivity (Lee, 2005). Existing literature also highlighted the significance of wage rate in supporting the enhancement of labor productivity. This fundamental concept relies on the ide that an increase in the real wage can develop productivity. In other words, the real wage corresponds to the productivity of labors (Dritsaki, 2016; Goh, 2009). Many studies, however, have claimed that ensuring a better wage is not an absolute factor that shapes productivity, and vice versa (Strauss & Wohar, 2004). Bester and Petrakis (2004) add that the differences in real wages in a company with financial stability are insignificant in boosting productivity.

Existing literature have also determined the significance of economic performance, such as role of industrial sector, economic openness, and infrastructure in improving productivity and attracting investment. Recent literature concluded the role of industrial sector in enhancing productivity (Chen, Jefferson, & Zhang, 2011; Fagerberg, 2000; Nakano & Managi, 2008; Carree, 2003). Furthermore, infrastructure is significant in increasing economic growth due its fundamental role in determining technical efficiency

(Mitra et al., 2012). Liberalization or openness induced attracts investmend and increase total exports, which further contribute to higher productivity rate and accelerate economic growth (Filiztekin, 2000; Amirkhalkhali & Dar, 2019; Wang, 2012). Therefore, recent literature provided arguments and debates regarding the association between economic performance, productivity, and economic growth.

Recent discussions on existing literature generates gap in conclusions. Accordingly, addressing the issue of labor absorption in industrial sector, productivity, and economic growth is needed. Indonesia is the archipelagic country with spatial differences in each region, which highlighted the importance of addressing the issue of regional labor absorption and sectoral productivity. Moreover, it is crucial to address the issue of labor absorption and industrial sector productivity in Indonesia due to spatial differences and inequality of development between the Western and Eastern part of Indonesia. Thus, this study aims at analysing the development of changes in economic structure in Indonesia and determining the factors stimulating productivity of labor in the industrial sector based on the comparison among regions in Indonesia.

METHODS

This study uses panel datasets of 34 provinces in Indonesia which is collected from Statistics Indonesia. This study develop few factors which have association with labor productivity, such as: 1) level of welfare (portrays by wage, expenditure per capita, working hours of productive age, educational level, and life expectancy rate); 2) macroeconomic performance (contribution of industrial sector to the economy, unemployment rate, and economic openness); and 3) physical infrastructure, such as electricity and width of quality roads. Therefore, the multiple regression model is as follows:

$$\begin{aligned} PLI_{it} = {} & \gamma_0 + \gamma_1 Wages_{it} + \gamma_2 ShareInd_{it} + \gamma_3 Openness_{it} + \gamma_4 Unemp_{it} \\ & + \gamma_5 ExCap_{it} + \gamma_6 WHL_{it} + \gamma_7 FDI_{it} + \gamma_8 SHSGen_{it} + \gamma_9 SHSVoc_{it} \\ & + \gamma_{10} ECI_{it} + \gamma_{11} Way_{it} + \varepsilon_{it} \end{aligned}$$

where PLI, Productivity of industrial sector labor, measured by the input of the labors with the output value of gross regional domestic product (GRDP) of the industrial sector in each province (IDR); Shareind, Contribution of the industrial sector to provincial GRDP (in percentage); Openness, the economic openness measured by comparing the import value and provincial export value (IDR); Unemp, The unemployment rate in each province (in percentage); ExpCap, The average provincial expenditure per capita (IDR); WHL, The number of labor with working hours above 35 hours per week in each province; FDI, The value of foreign investment in each province (USD); SHSGen, the number of senior high students in each province; SHSVoc, The number of vocational high school students in each province; LE, Provincial life expectancy rate per year; ECI, Capacity of electrical installation in each province (Megawatt); Way, the width of roads in good condition (Km).

Since the study employs a panel data analysis, we firstly conduct Hausman test to determine the appropriate model between fixed effect and random effect model. Prior to the statistical test, classical assumption tests were also conducted. Those tests involved 1) multicollinearity test (to estimate the level of association or correlation between independent variables through the number of correlation coefficient (r); 2) heteroscedasticity test (to examine whether or not the variances of the residual among the observation were the same; and 3) autocorrelation test with Durbin-Watson test.

RESULTS AND DISCUSSION

This study aims to analyse the labor productivity in industrial sector in Indonesia. This study further focuses on comparing the agricultural and industrial sector's development in Indonesia to further understand the labor productivity issue in industrial sector. Accordingly, this study analyse the elasticity changes of agricultural and industrial sector in 2014 to 2019 and further determine the contributing factors of labor productivity in industrial sector in Indonesia. This study also focuses on the spatial differences in sectoral development in Indonesia, which further result in categorization of regions into six categories, as follows: Sumatera, Java, Kalimantan, Sulawesi, Bali-Nusra, and Maluku-Papua. Therefore, this study develops elasticity changes analysis and panel data analysis in examining labor productivity of industrial sector in Indonesia.

The economic transformation in Indonesia has occurred since the 1980s, along with the implementation of deregulation in many sectors. Such changes are represented by the fall in the agricultural share and the rise in the share of the secondary and the tertiary sector to total GDP. As evident in Table 1, total share of agricultural sector decline from 2014 to 2019 in each region. Sumatera experienced decline in the share of the agricultural sector by 1.53 percent. The decline of agricultural sector in Java, Kalimantan, Sulawesi, Bali-Nusra, Maluku-Papua reached 0.87 percent, 1.87 percent, 1.13 percent, 1.71 percent, and 1.15 percent, respectively. Moreover, Table 1 shows the decline of elasticity labor absorption in agricultural sector in all region from 2014 to 2019, while on the contrary, the labor absorption in industrial sector appears to increase in all region.

Table 1. Changes in the share/economic structure and proportion of labor based on the region (island/area) in 2014 and 2019

Region	Δ Agricultural Sector (%)	Δ Industrial Sector (%)	Δ Composition of Labors in Agricultural Sector	Δ Composition of Labors in the Industrial Sector (%)
Sumatera	(1.53)	(0.82)	(5.88)	8.42
Java	(0.87)	(1.42)	(4.79)	6.72
Kalimantan	(1.87)	(0.30)	(9.75)	9.87
Sulawesi	(1.13)	(0.74)	(10.56)	10.24
Bali-Nusra	(1.71)	0.82	(6.89)	7.62
Maluku-Papua	(1.15)	(1.23)	(9.97)	1.69

Source: Statistics Indonesia (2020)

Furthermore, Table 1 shows that despite increasing labor absorption in industrial sector, the total share of industrial sector appears to decline from 2014 to 2019, except for Bali-Nusra. According to the result provided in Table 1, we suggest that the drastic drop of agricultural sector in Bali-Nusra induced increase in industrial activities in the region, which further increases the industrial sector share. However, other regions, such as Sumatera, Java, Kalimantan, Sulawesi, and Maluku-Papua suffers decline of industrial sector share despite increasing labor absorption. This result further verifies the main argument which highlighted low labor productivity in regional industrial sector in Indonesia.

Following previous analysis, we employ panel data analysis to further address the issue of labor productivity in industrial sector in Indonesia. To segregate the spatial differences in Indonesia, we further compare the Western (16 provinces) and Eastern (18 provinces) part of Indonesia as our main analysis. As discussed in the previous section,

we have determined specific contributing factors which associate with labor productivity in industrial sector. The econometric analysis is further summarized in Table 2.

The equation model consists of 11 independent variables that are determinant in influencing the productivity of the labor in the industrial sector. According to the estimation, not all variables in both equations for the western part and eastern part of Indonesia are significant and have a positive association. There are only four contributing variables in the western part of Indonesia, namely real wages, working hours (above 35 hours per week), vocational school level, and electricity supply. In the eastern part of Indonesia, this study finds seven factors that stimulate productivity; those involve real wages, the share of the industrial sector, unemployment rate, working hours (above 35 hours per week), average expenditure per capita, foreign investment, and electricity supply. The variable with the most significant determinant power in boosting the productivity of industrial labor in the western part of Indonesia is the real wage; this finding contrasts with the one in the eastern area, where the electricity supply is central to labor productivity.

Real wage and working hours are the only variables serving as the contributing factors in both the Western and eastern part of Indonesia. Still, the impact of increasing the real wage in the Western part of Indonesia is more significant to the productivity enhancement compared to the one in the Eastern part. The improvement of the wage for the labor every year, for example, by 10 percent, can motivate labor, which further increase labor productivity; this notion applies in all regions in Indonesia. Specifically, the increase in the minimum regional wage periodically can escalate the productivity in the industrial sector; this idea is supported findings in previous studies (Kumar, Webber & Perry, 2011; Vergeer, & Kleinknecht, 2014). However, the adjustment of the wage in each regions and provinces is different from one area to another; this is due to varied performances and capacities of the industrial sector in each region.

Table 2. Summary of the estimation of contributing factors of labor productivity in the industrial sector in Indonesia

Independent Variable	Western Indonesia Area		Eastern Indonesia Area	
	Coefficient	Stat	Coefficient	Stat
CONSTANT	-0.0039	-0.0107	-0.0756	-2.3856
LOG(WAGES?)	0.0235	3.1042**	0.0066	3.0810**
SHAREIND?	0.0007	1.0954	0.0005	1.8304*
OPENESS?	-0.0091	-1.3037	-0.0001	-0.1852
LOG(UNEMP?)	0.0029	0.3210	-0.0037	-2.3794*
LOG(WHL?)	0.0102	1.8088*	0.0046	2.5410*
LOG(EXCAP?)	-0.0395	-1.2779	-0.0015	-1.7173*
LOG(FDI?)	-0.0023	-0.9917	-0.0010	-1.8840*
LOG(SHSGEN?)	0.0093	1.5544	0.0007	0.4737
LOG(SHSV?)	0.0087	2.1051*	-0.0006	-0.3448
LOG(ECI?)	-0.0057	-1.9878*	-0.0030	-12.964***
LOG(WAY?)	-0.0014	-0.3624	-0.0003	-0.4001
R-Adjusted	*0.2592*		*0.8553*	
F-Stat	*4.0231*		*23.597*	
DW	*1.5809*		*1.5358*	

Furthermore, the labor structure in Indonesia is dominated by freelancers or outsources, which provided less than 35 working hours per week. According to the analysis, such phenomenon decreases labor productivity in industrial sector. Labor productivity tends to increase if the working hours is above 35 hours per week, according to the econometric analysis. This result appears to be confirmed in Western and Eastern part of Indonesia. However, such result differs from recent literature in Garnero et al. (2014) in Belgium, which highlighted the increasing productivity of male freelancers with above 25 hours of working. The result of this study may differ than the recent findings mainly due to spatial differences, technology, and labor initial skills between industrial sector development in Indonesia and Belgium.

Moreover, labor productivity in industrial sector in Western part of Indonesia are driven by vocational education background. This implies that vocational school graduaets are considered prepared to enter the industry through their specific skills compared to regular school graduates. The result is in line with findings of Min & Tsang (1990) which suggested that vocational school graduates have better outputs and productivity than other graduates due to their education background. The result of the present study becomes relevant to the actualization of the government's vision to create better curriculum of vocation schools to induce high quality labor or worker from vocational schools.

The slow growth of industrialization in Indonesia, especially in the Eastern area, contributes to a high unemployment rate among vocational school graduates. This concern urges the realization of new industries or relocation of the industry from Java Island to some provinces in the Eastern part of Indonesia. Many investors have criticized the issue of electricity in the development of infrastructures. This problem, nonetheless, has been addressed. Tovar, Ramos-Real, & Almeida (2010) point out that the provision and distribution of electricity are central to shaping the productivity of the industrial sector. Recently, the government has continued their endeavor to provide electrical supply, thus fulfilling the needs for electricity, and even the supply is in surplus in some areas. The result of the present study shows that an improvement in the capacity of electrical installation in the Western part of Indonesia has weakened the productivity of industrial labor. Similarly, the improved capacity of electricity is not that significant to boost the productivity of the labor in the Eastern part of the country since the use of machines is substitutional.

The existence of industries is basically capable of spurring the productivity of labor. According to the estimation result, every increase in the share of the industrial sector in the Eastern area of Indonesia is significant to increase the labor productivity in the sector. The productivity of labor can be improved along with the improvement of TFP. It should be noted that two main factors are central to stimulating the TFP of the manufacturing industries. Those factors are the companies that efficiently utilize machinery and technical changes through more advanced technological adaptation (Surjaningsih & Permono, 2014).

Unemployment in the Eastern part of Indonesia is impactful on the productivity of industrial labor, indicating that every rise in the unemployment rate decreases the productivity of the labor in the industrial sector. This finding, however, can be the subject of debate since the mainstream economists consider that productivity has a contribution to unemployment (Gallegati, Ramsey, & Semmler, 2014). Other than the unemployment rate, foreign investment plays a major role in weakening productivity. This finding resonates with the previous studies in many Gulf States (Elmawazini, 2014). There are no substantial differences between the productivity of labor in foreign companies and local companies. This concept is in line with a result seen in Khalifah & Adam (2009),

which reveals that either foreign companies or companies owned by minorities have lower productivity than local companies in Malaysia.

CONCLUSIONS AND RECOMMENDATIONS

Conclusion

The industrial sector's performance is expected to growth steadily, which further transform Indonesia's economic structure. This study further addresses the issue of labor productivity in industrial sector to formulate better policies regarding industrial sector development in Indonesia. This study provides several conclusions regarding the analysis on changes of economic structure and labor productivity of industrial sector in Indonesia. Firstly, the share of agricultural sector has declined from 2014 to 2019, which is also followed by the decrease of labor absorption in agricultural sector. Secondly, the labor absorption in industrial sector appears to increase. However, the share of industrial sector appears to decline, except for the region of Bali-Nusra. This finding highlighted problems of labor productivity in industrial sector in Indonesia from 2014 to 2019. Accordingly, through econometric analysis, we determine the contributing factors which will result in the increase of labor productivity in industrial sector in the Western and Eastern part of Indonesia. The result shows that real wage is significant in increasing labor productivity in the Western part of Indonesia, while provision of electricity is the main contributing factor of labor productivity in the Eastern part of Indonesia. However, the result also shows that provision of electricity could either benefit or hamper labor productivity in Indonesia. This phenomenon emphasized that electricity supply is indeed substitutional to labor.

Recommendations

The government should take several recommendations into account. Firstly, government needs to reshape the industrial sector development in Eastern part of Indonesia. Government needs to relocate and stimulate industrial potential in Eastern part of Indonesia according to spatial characteristics in each region. Government also need to address the issue of regional inequality in each region to further accelerate infrastructure and industrial sector development in Indonesia. Second, government need to consider increasing real wages according to macroeconomic performance in Indonesia. The capability of social protection for labor is also crucial in reducing economic burden and maximize labor's performance and productivity.

REFERENCE

Aísa, R., Pueyom F,. & Sanso, M. (2012). Life Expectancy and Labor Supply of The Elderly. *Journal of Population Economics*, 25 (2), 545 – 568.

Amassoma, D., & Nwosa, P.I. (2013). The Impact of Unemployment Rate on Productivity Growth in Nigeria: An Error Correction Modeling Approach. *International Journal of Economics and Management Sciences*, 2(8), 1 - 13.

Amirkhalkhali, S. & Dar, A. (2019). Trade Openness, Factor Productivity, and Economic Growth: Recent Evidence From OECD Countries (2000-2015). *Applied Econometrics and International Development*, 19(1), 5 – 14.

Bester, H. & Petrakis, E. (2004). Wages and Productivity Growth in a Dynamic Monopoly. *International Journal of Industrial Organization*, 22 (1), 83 – 100.

Bräuningera, M. & Pannenberg, M. (2002). Unemployment and Productivity Growth: An Empirical Analysis within an Augmented Solow Model. *Economic Modelling*, 19(1), 105 – 120.

Carree, M. A. (2011). Technological Progress, Structural Change and Productivity Growth: A Comment. *Structural Change and Economic Dynamics*, 14(1), 109 – 115.

Cecchini, L. & Lai-Tong, C. (2011). The Links Between Openness and Productivity in Mediterranean Countries. *Applied Economics*, 40(6), 685 – 697.

Chenery, H. B. & Syrquin, M. (1975). *Patterns of Development, 1950- 1970*. London: Oxford University Press.

Dollard, M. F. & Neser, D. Y. (2013). Worker Health is Good for The Economy: Union Density and Psychosocial Safety Climate as Determinants of Country Differences in Worker Health and Productivity in 31 European Countries. *Social Science & Medicine*, 92(3), 114 – 123.

Dritsaki, C. (2016). Real Wages, Inflation, and Labor Productivity: Evidences from Bulgaria and Romania. *Journal of Economic & Financial Studies*, 4(5), 24 – 35.

Elmawazini, K. (2014). FDI Spillovers, Efficiency Change and Host Country Labor Productivity: Evidence from GCC Countries. *Atlantic Economic Journa*l, 42(4), 399 – 411.

Fagerberg, J. (2014). *Technological Progress, Structural Change and Productivity Growth: A Comparative Study*. No 5, Working Papers from Centre for Technology, Innovation and Culture, University of Oslo. http://www.sv.uio.no/tik/InnoWP/2000_Fagerberg_SCED_manuscript_2014.pdf

Filiztekin, A. (2000). *Openness and Productivity Growth in Turkish Manufacturing*. Global Trade Analysis Project, Sabanci University Discussion Paper Series in Economics. gtap.agecon.purdue.edu.

Gallegati, M., Ramsey, J. B. & Semmler, W. (2014). *Does Productivity Affect Unemployment? A Time-Frequency Analysis for the US*. Wavelet Applications in Economics and Finance, Book Series 20, 23 - 46.

Garnero, A., Kampelmann, S. & Rycx, F. (2014). Part-Time Work, Wages, and Productivity: Evidence from Belgian Matched Panel Data, *ILR Review*, 67(3), 926 – 954.

Goh, S. K. (2009). *Is Productivity Linked To Wages? An Empirical Investigation in Malaysia*. Published in: CenPRIS Working Paper Series 102/09.

Holman, C., Joyeux, B. & Kask, C. (2008). Labor Productivity Trends Since 2000, By Sector and Industry. *Monthly Labor Review*, 7(1), 64 - 82.

Khalifah, N. A. & Adam, R. (2009). Productivity Spillovers from FDI in Malaysian Manufacturing: Evidence from Micro- Panel Data. *ASIAN Economic Journal*, 23 (2), 143 -167.

Kumar, S., Webber, D.J. & Perry, G. (2011). Real Wages, Inflation and Labour Productivity in Australia. *Journal Applied Economics*, 44(23), 2945 – 2954.

Lee, J.W. (2005). *Human Capital and Productivity for Korea's Sustained Economic Growth*. Journal of Asian Economics, 16(4), 663 – 687.

McCunney, R.J. (2001). Health and Productivity: A Role for Occupational Health Professionals. *Journal of Occupational and Environmental Medicine*, 43(1), 30 - 35.

Min W. F., & Tsang, M. C. (1990). Vocational Education and Productivity: A Case Study of the Beijing General Auto Industry Company. *Economics of Education Review*, 9(4), 351 – 364.

Mitra, A., Sharma, C. & Véganzonès-Varoudakis, M-A. (2012). Estimating Impact of Infrastructure on Productivity and Efficiency of Indian Manufacturing. *Journal Applied Economics Letters*, 19 (8), 779 – 783.

Nakano, M. & Managi, S. (2008). Regulatory Reforms and Productivity: An Empirical Analysis of The Japanese Electricity Industry. *Energy Policy*, 36(1), 201 – 209.

Rangazas, P. (2002), The Quantity and Quality of Schooling and U.S. Labor Productivity Growth (1870–2000). *Review of Economic Dynamics*, 5 (4), 932 – 964.

Shiyi Chen, S., Jefferson, G. H. & Zhang, J. (2011). Structural Change, Productivity Growth and Industrial Transformation in China. *China Economic Review*, 22(1), 133 – 150.

Soekimana, A., Pribadib, K.S. Soemardi, B. W. & Wirahadikusumah, R. D. (2011). *Factors Relating to Labor Productivity Affecting the Project Schedule Performance in Indonesia*. Procedia Engineering, 14, 865 – 873. The Proceedings of the Twelfth East Asia-Pacific Conference on Structural Engineering and Construction: EASEC12

Strauss, J. & Wohar, W.E. (2004). The Linkage Between Prices, Wages, and Labor Productivity: A Panel Study of Manufacturing Industries. *Southern Economic Journal*, 70 (4), 920 – 941.

Surjaningsih, N., & Permono, B. P. (2014). Dinamika Total Factor Productivity Industri Besar dan Sedang Indonesia. *Buletin Ekonomi Moneter Dan Perbankan*, 16(3), 277 - 308.

Tovar, B. Ramos-Real, F., & Almeida, E. F (2011). Firm Size and Productivity. Evidence From the Electricity Distribution Industry in Brazil. *Energy Policy*, 39(2), 826 -833.

Vergeer, R. & Kleinknecht, A. (2014). The Impact of Labor Market Deregulation on Productivity: A Panel Data Analysis of 19 OECD Countries (1960 - 2004). *Journal of Post Keynesian Economics*, 33(2), 371- 408.

Wang, Y. (2010). FDI and Productivity Growth: The Role of Inter- Industry Linkages. *Canadian Journal of Economics*, 43(4), 1243 – 1272.

Wang, Y. (2012). Openness and Productivity: The Role of Imports, FDI and International Telecommunications, Latin American Journal of Economics, 49(1), 125 – 145.

Wu, Y. (2004). Openness Productivity and Growth in The APEC Economies. *Empirical Economics*, 29, 593 – 604.

Zhu, G. & Tan, K.Y. (2001). Foreign Direct Investment and Labor Productivity: New Evidence from China As the Host. *Thunderbird International Business Review*, 42 (5), 507 – 528.

Effect of labor and number of micro and small enterprises (MSEs) on poverty rate in Indonesia

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Abstract

The study aims to analyze the poverty and micro and small enterprises in 34 provinces in Indonesia, and to analyze the effect of labor and the number of micro and small enterprises on poverty levels in Indonesia. The results indicate that Papua Province has the highest poverty rate and the DKI Jakarta Province has the lowest poverty rate. Central Java Province has the largest number of micro-enterprises, and West Papua Province has the lowest number of micro-enterprises. For small enterprises, Central Java Province has the highest number and West Papua Province has the lowest number. Meanwhile, Central Java Province as the largest number of micro-business workers, and West Papua Province has the lowest number workers. For small business workers, Central Java Province has the largest number and West Papua Province has the lowest number. The results of panel data regression show that some variables, such as small-enterprise worker and the number of micro enterprises, have a significantly negative effect on the poverty rate. On the other hand, micro-enterprise worker and the number of small enterprises have a positive and significant effect on poverty rate.

Keyword: *Poverty, Labor, Micro and small enterprises*

JEL Classification: O14, I32, J21, J24

INTRODUCTION

Development and poverty are like two sides of a coin, and both go together in an attempt to improve or as part of underdevelopment and inability to meet the basic needs of life. The structural approach to poverty suggests that there are shortcomings in the geographical, ecological, technological, and demographic aspects that still require efforts to empower them, especially for the food needs. Many previous studies on the determinants of poverty and well-being have been conducted. Empirical findings, however, continue to generate controversy among researchers (Hardiwan, Amir, Junaidi & Delis, 2019) and there is no profound empirical answer by looking at the exact factors that could influence poverty and household welfare.

At the national level, the poverty rate had decreased in Indonesia since the beginning of the New Order era. It went from about 40% in 1970 to 17.5% in 1996. However, after the Asian monetary crisis of 1997-1998, the poverty rate (due to the forced closure of a large number of industries/companies and reduced production

volume) increased to 24.2% in 1998. Then it started to decline every year and was recorded at 12.5% in 2011. However, the poverty rates vary between provinces and many provinces have it far above the national average. In 2010, the national poverty rate was 13.3% and in the same year there were 16 provinces with poverty rates above the national level. Papua has turned to be the poorest province, and DKI Jakarta has the lowest rate of about 4%.

There are several causes that contribute to poverty, as well as the poverty rate difference between provinces. This is partly due to differences in the determinants of poverty, particularly job opportunities in the formal sector. Regions with high rate of open unemployment are typically considered poor areas. The number of open unemployment is known to be the key factor, but not the only factor determining the cause of poverty. Poverty in a region can be very noticeable, although the number of people with non-permanent jobs in the formal sector is very limited. In general, poverty in this case is caused by low income or low real wage of workers that is below the minimum wage of the regency/city. There are many villages in Indonesia whose economic activities are generally in micro or small scale in the informal sector with very low incomes.

Theoretically, the relationship between Micro and Small Enterprises (MSEs) and poverty in a region have two possibilities, respectively "positive" and "negative". This is a positive relationship as MSEs exist due to poverty. In general, a business emerges when there are demand markets, both the output market (goods and services) for selling products and input market (labors) for receiving inputs for production. This relationship also applies to the growth of MSEs. However, in many developing/poor countries, the presence of output and input markets that grow rapidly the number of MSEs is closely related to poverty.

In his research on micro and small-sized enterprises (MSEs) and poverty, Tambunan (2012) explored the role of MSEs in poverty alleviation in the region. The findings of this study indicate that MSEs are indeed important for the reduction of poverty in the region (province). However, its role varies between provinces, as gaps in MSEs' access to essential inputs such as education, technical assistance, raw materials, and capital are found. Even then, an in-depth study is required to examine the role of SMEs in poverty alleviation.

Several studies have found the relationship between poverty reduction, economic growth, and micro-enterprise development. Research by Mduduzi Biyase & Talent Zwane, revealed the determinants of poverty and household welfare in South Africa. Contrary to most existing studies that applied ordinary least squares (OLS) and probit and logit models to cross-sectional data, this study found the unobserved individual heterogeneity and endogeneity, in which both are viafix and through robust alternative based on random-effects probit model. The results of fixed and random effects show that the educational attainment of the head of the household, the race of the head of the household, the dependency ratio, the gender of the head of the household, working status of the head of the household, and the marital status of the head of the household are statistically significant determinants of household welfare.

The results of Jasin, Saud, Isa, & Hussain's study (2016) suggest that the bureaucratic procedures have no meaningful relationship with micro-enterprises' performance. However, facilities have a significant effect on the micro-enterprises' performance. Haryadi & Rosmeli (2018) examined the factors influencing the income of MSMEs in Jambi City. The findings indicate that labor have a positive effect on the development of MSMEs in Jambi City. According to Rahmini's study (2017), the success experienced by MSMEs has shortcomings that need to be fixed immediately,

including lack of capital, lack of managerial skills, and limited operational and marketing skills encountered by all SMEs at the start of growing a business.

According to Machmud & Sidharta (2013), the development of MSMEs in Bandung City can be carried out using a strategic approach. The first step is to determine factors impacting MSMEs and then to evaluate the strengths, weaknesses, opportunities, and threats of MSMEs. The next step is the formulation of MSME development concept as well as the goals and objectives. The implementation of MSME policies, MSME development programs, and MSME development activities may be carried out after the formulation of concept, goals, and objectives.

Danuar (2017) and Junaidi, Yulmardi & Hardiani (2020 points out that the growth of MSMEs still faces a range of challenges in many regions. Research by Danuar (2017) findings in SMEs in Semarang indicate that SMEs in the creative sector have limited abilities and experience difficulties in expanding their business. This causes SMEs in the creative sector not to be able to provide Semarang with distinctive characteristics. The problems faced by SMEs in Semarang include capital, raw materials and production factors, labor, transaction costs, marketing, and IPR (Intellectual Property Rights). Harvie (2013) conducted a study to evaluate the contribution of micro-enterprises to economic recovery and poverty alleviation in East Asia.

Based on these, the study aims to analyze the poverty and micro and small enterprises in 34 provinces in Indonesia, and to analyze the effect of labor and the number of micro and small enterprises on poverty levels in Indonesia

METHODS

This study uses panel datasets of 34 provinces during 2013-2017 in Indonesia. The data were obtained from Statistics Indonesia. Analysis is carried out using multi-regression analysis using panel data method. This approach can be used as a prediction model for a dependent variable from one independent variable using time series and cross-section data. The model is:

$$K_{it} = \beta_0 + \beta_1 Log(TKK)_{it} + \beta_2 Log(TKM)_{it} + \beta_3 Log(JUK)_{it} + \beta_4 Log(JUM)_{it} + \varepsilon_{it}$$

Whereas:

K	: Poverty (Number of poor population)
TKK	: Number of small-enterprise labor
TKM	: Number of micro-enterprise labor
JUK	: Number of small enterprises
JUM	: Number of micro-enterprises
i	: Cross section (34 provinces in Indonesia)
t	: From 2013 to 2017
β_0	: Constant
$\beta_{1,2,3,4}$,	: Regression coefficient
ε	: Error term

RESULTS AND DISCUSSION

Poverty and micro and small enterprises in Indonesia

Data are given to show the poverty condition (the number of poor population and poverty rate) and small enterprise condition (number of micro enterprises, number of small enterprises, micro-enterprise labor, and small-enterprise labor) in 34 provinces in Indonesia during the period 2013-2017. However, statistics on micro and small

enterprises over the last two years (2016-2017) are predictive data. Details are provided in the Table 1.

Table 1. Poverty and MSEs in Indonesia

Provinces	Number of poor population	Poverty rate	Number of micro enterprises	Number of small enterprises	Micro-enterprise labor	Small-enterprise labor
Aceh	845	16.83	69,036	2,202	117,401	15,904
North Sumatera	1,408	10.12	79,372	10,381	150,344	78,067
West Sumatera	364	7.01	64,688	5,654	112,823	44,743
Riau	516	8.06	15,477	1,235	30,818	8,389
Jambi	289	8.44	23,541	2,062	45,353	13,970
South Sumatera	1,098	13.59	54,393	6,694	101,762	52,190
Bengkulu	318	16.92	11,229	803	22,943	5,617
Lampung	1,120	13.81	86,981	7,874	182,652	61,859
Bangka Belitung Islands	70	5.08	7,668	756	14,671	5,683
Riau Islands	122	6.10	11,735	1,081	17,520	7,826
Dki Jakarta	387	3.79	21,453	15,979	50,993	141,877
West Java	4,210	8.99	416,345	72,982	824,217	596,023
Central Java	4,493	13.35	792,823	103,598	1,507,783	812,157
Di Yogyakarta	502	13.64	64,348	8,136	113,296	68,205
East Java	4,687	12.07	646,456	57,793	1,274,632	474,030
Banten	676	5.62	86,144	7,466	149,932	62,384
Bali	191	4.56	96,386	12,114	163,516	98,313
West Nusa Tenggara	791	16.38	88,724	12,158	159,764	131,979
East Nusa Tenggara	1,089	21.16	93,476	2,596	159,014	20,543
West Kalimantan	392	8.22	42,432	1,350	79,597	10,262
Central Kalimantan	144	5.77	16,001	980	29,666	6,726
South Kalimantan	188	4.70	62,375	3,015	101,443	24,122
East Kalimantan	230	6.17	15,559	2,062	132,081	79,768
North Kalimantan	50	7.75	2,545	358	23,767	14,516
North Sulawesi	202	8.37	37,367	785	66,540	5,904
Central Sulawesi	406	14.06	29,807	2,072	56,125	15,965
South Sulawesi	830	9.74	103,194	6,375	187,934	53,661
Southeast Sulawesi	325	13.00	57,335	3,705	107,982	25,978
Gorontalo	201	17.67	18,516	1,145	32,810	8,207
West Sulawesi	152	11.71	21,390	1,013	34,418	7,680
Maluku	322	18.92	29,988	363	47,415	2,616
North Maluku	80	6.82	7,665	108	11,768	832
West Papua	224	25.43	2,138	100	3,976	721
Papua	929	28.78	8,510	609	18,809	3,874

Source: Statistics Indonesia (Processed Data)

As shown in Table 1, each variable has fluctuated in most provinces. The highest poverty rate is in Papua Province of 28.7% and the lowest poverty rate is in DKI Jakarta Province of 3.79%. Central Java Province has the highest number of micro-enterprises, with 792,822 units, and West Papua Province has the lowest number of 2,138 units. Central Java Province also has the highest number of small enterprises with 103,598 units, while West Papua has the lowest number of only 100 units.

The province with the largest number of micro-business workers is Central Java Province with 1,507,782 people and West Papua Province has the lowest number with 3,975 people. For small-enterprise workers, Central Java also has the largest number, with 812,157 people, and West Papua Province has the lowest number, with 720 people.

Influence of the number of micro and small enterprises and micro and small labor on poverty rates in Indonesia

To determine the effect of the number of micro and small enterprises, and small and micro enterprise labor on poverty rates in Indonesia, this study used multi-regression panel data with a semi-log model based (which produce three panel data models: Common Effect, Fixed Effect and Random Effect). To choose the best panel data regression model from the three models, three testing methods are used (Chow Test, Hausman Test and LM Test) (see appendix). Based on the results of the three tests and the results of the regression output, it is concluded that Common Effect is the best model. Panel data regression with common effect can be seen in Table 2.

Table 2. Results of panel data regression with Common Effect

Variable	Coefficient	Std. Error	t-Statistics	Prob.
C	26.16187	5.673888	4.610925	0.0000
LOG (TKK?)	-11,63971	3.063066	-3.800021	0.0002
LOG (TKM?)	10,06482	3,289888	3.059320	0.0026
LOG (JUK?)	10,20360	3.025126	3.372949	0,0009
LOG (JUM?)	-8.702513	3.086611	-2.819440	0.0054
R-squared	0.129765	Mean dependent var		11,54812
Adjusted R-squared	0.108668	SD dependent var		6.033314
SE of regression	5.696074	Akaike info criterion		6,346402
Sum squared resid	5353,468	Schwarz criterion		6.438631
Log likelihood	-534,444	Hannan-Quinn criter.		6.383828
F-statistics	6.150977	Durbin-Watson stat		0.120779
Prob (F-statistic)	0,000123			

Based on the results of panel data regression, it indicates that small enterprise labor and the number of micro-enterprises have a negative and significant effect on the poverty rate. This signifies that increasing the labor absorption by small enterprises will reduce the poverty rate. However, an increase in the number of small enterprises will raise the poverty level. Thus, the opposite effect on poverty is between labor and the number of small enterprises. This phenomenon shows that developing existing small businesses is better than adding business units because, in order to increase goods production, they will employ more workers. Absorption of small enterprise workers has a negative effect on poverty.

In the case of micro-enterprises, it also has an inverse correlation between the number of enterprises and the labor. The number of micro-enterprises has a negative impact on poverty, while the labor affects poverty rate positively. This assumes that adding micro-enterprise units will minimize the poverty rate, and adding more labor will raise the poverty rate. The growth of micro-enterprises should be continued by increasing the number of business units without raising the number of employees. This is presumably because the wage or income earned by micro-enterprise workers is smaller than that received by employees in small enterprises.

Based on the results of the analysis, it has been found that small enterprises and micro-enterprises, both in terms of number of businesses and their labor force, have a substantial effect on the poverty rate. Ideally, all four independent variables have a negative influence on the poverty rate. However, there are only two variables that have a negative impact on the poverty rate. The findings of this study show that the number of small enterprises should not be expanded, but that the output of existing small enterprises should be produced on a larger scale. The greater volume of production would absorb more labor force. In the case of small enterprises, labor has a negative effect on poverty. Meanwhile, for micro-enterprises, it is necessary to increase the

number of business units without raising the number of employees. Labor in micro-enterprises has a positive impact on the poverty rate.

Several empirical studies on MSMEs on poverty and other economic indicators, such as Dartanto & Nurkholis (2013), have shown that the provision of micro-credit has a significant effect on poverty. Supriyadi and Kausar (2016) also found that SMEs are contributing to the economy and development in Indonesia. Other study similar to this study, Tareq & Rahman (2020) has argued that rural micro-enterprises play a significant role in reducing poverty. Our results indicate that policies should support the development of new micro-enterprises and expand existing enterprises that will help to alleviate poverty. Sarker & Gazi (2013) have demonstrated a connection between poverty reduction and micro-enterprises in Bangladesh.

CONCLUSION AND RECOMMENDATIONS

Conclusion

The highest poverty rate is in Papua Province with 28.7% and the lowest poverty rate is in DKI Jakarta Province with 3.79%. For the number of micro enterprises, Central Java Province has the largest number with 792,822 units, and West Papua Province has the lowest number with 2,138 units. For small enterprise, Central Java Province also has the largest number with 103,598 units, and West Papua has the lowest number with only 100 units. Province with the highest number of micro-business workers is Central Java Province with 1,507,782 people and West Papua Province has the lowest number with 3,975 people. For small enterprise workers, Central Java also has the largest number with 812,157 people and West Papua Province has the lowest number with 720 people.

The results of panel data regression with common effect model indicate that small enterprise labor and the number of micro-enterprises have a significant negative effect on poverty level, while micro-enterprise labor and the number of small enterprises have a positive and significant effect on poverty level.

Recommendations

For practitioners, current poverty alleviation programs must first be pursued and expanded, especially in regions with a high poverty rate. Second, existing small enterprises need to be developed without raising the number of units, but by growing the size of production so that they can accommodate the maximum workforce and help reducing poverty rate. Third, the development of micro enterprises has to be achieved by continuing to expand the number of business units without the recruitment of more employees in order to alleviate poverty.

For researchers, this study limited the research period to only five years. Further studies, therefore, should expand the research period and incorporate more variables.

REFERENCES

Biyase, M., & Zwane, T. (2018). An Empirical Analysis of the Determinants of Poverty and Household Welfare in South Africa. *Journal of Developing Areas*, 52(1), 115–130.

Danuar, D. (2013). Development of Micro, Small and Medium Enterprises (MSMEs) Based on Creative Economy in the City of Semarang. *Diponegoro Economic Journal*, 2(4),. 1-13

Dartanto, T., & Nurkholis. (2013). The determinants of poverty dynamics in Indonesia: evidence from panel data. *Bulletin of Indonesian Economic Studies*, 49(1), 61.

Hardiwan, D., Amir, A., Junaidi, J. & Delis, A. (2019). The linkages and impact of plantation-based sectors on economy and poverty in Jambi province, Indonesia: Miyazawa's input-output model. *Agricultural and Resource Economics: International Scientific E-Journal*, 5(3), 5-19

Haryadi & Rosmeli (2018) Model of one Village one Product development with triple helix approach in improving the role of micro small and medium enterprises in Jambi city Indonesia. *International Journal of Business, Economics and Law*, 17(3), 49-57

Harvie, C. (2003). *The Contribution of Microenterprisesto Economic Recovery and Poverty Alleviation in East Asia*, Working paper no. 03-07, Department of Economics, University of Wollongong, Australia.

Jasin, H., Saud, M.B, Isa, M.A.M & Hussain, F. (2016) Facilities and bureaucratic process of Malaysian local authorities influenced on micro enterprises business performance. *International Journal of Business, Economics and Law*, 10(2), 14-20

Junaidi, J., Yulmardi, Y. & Hardiani, H. (2020). Food crops-based and horticulture-based villages potential as growth center villages in Jambi Province, Indonesia. *International Journal of Advanced Science and Technology*, 29(3), 6118 - 6133

Rahmini, Y. (2017). Development of MSMEs (Micro, Small and Medium Enterprises) in Indonesia. *CanoEconomics Scientific Journal*, 6(1).

Sarker, M.M.H. & Gazi, M.A.I. (2013). Poverty Reduction and Microenterprise in Bangladesh: Issues, Imperatives and Interventions, *ASA University Review*, 7(2), 169-182.

Supriyadi, E. & Kausar, D.R.K. (2016). Impact of Inflation and Exchange Rate Rupiah toward Poverty and Unemployment in Indonesia (Case Study: Small Industry in the Tourist Area of Lombok). *Journal of EST (Educational Science And Technology)*, 2(3), 204-212

Tambunan, T.T.H. (2012). Peran Usaha Mikro dan Kecil dalam Pengentasan Kemiskinan di Daerah. *Jurnal Bina Praja*, 4(2), 73 - 92

Tareq, M., & Rahman, M. A. (2020). Foster, Greer and Thorbecke Class of Poverty Measures to Assess the Role of Rural Microenterprises in Poverty Reduction in Bangladesh. *Journal of Developing Areas*, 54(1), 89–103.

APPENDIX

Table 3. Chow Test (Common Efect vs Fixed Effect)

Redundant Fixed Effects Tests			
Pool: POOL			
Test cross-section fixed effects			
Effects Test	**Statistics**	**df**	**Prob.**
Cross-section F	319.873412	(33,132)	0.0000
Chi-square cross-section	746.989924	33	0.0000

H0 : Common effect

H1 : Fixed effect

Probability is 0.000<5%, so H0 is rejected and fixed effect model is accepted.

Table 4. Hausman Test (Fixed Effect vs Random Effect)

Correlated Random Effects - Hausman Test Pool: POOL Random effects cross-section test			
Summary Test	**Chi-Sq. Statistics**	**Chi-Sq. df**	**Prob.**
Random cross section	7.091088	4	0.1312

H0 : Random effect

H1 : Fixed effect

Probability is 0.1312>5%, so H0 is accepted and H1 is accepted. Thus, the best model is Random Effect.

Table 5. Lagrange Multiplier Test (Random Effect vs Common Effect)

Lagrange Multiplier Tests for Random Effects			
Null hypotheses: No effects			
Alternative hypotheses: Two-sided (Breusch-Pagan) and one-sided (all others) alternatives			
	Hypothesis Test		
	Cross section	Time	Both
Breusch-Pagan	298.7374 (0.0000)	0.755050 (0.3849)	299.4924 (0.0000)
Honda	17.28402 (0.0000)	-0.868936 -	11,60722 (0.0000)
King Wu	17.28402 (0.0000)	-0.868936 -	4.862328 (0.0000)
Standardized Honda	18,51063 (0.0000)	-0.618729 -	8.652715 (0.0000)
Standardized King-Wu	18,51063 (0.0000)	-0.618729 -	2,577921 (0.0050)
Gourierioux, et al. *	-	-	298.7374 (<0.01)
* Mixed chi-square asymptotic critical values:			
1%	7,289		
5%	4,321		
10%	2,952		

Capital market and economic growth in Nigeria

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Abstract

The objective of this study is to empirically examine the nexus between capital market and economic growth in Nigeria between 1980 and 2017. In the cause of pursuing the desired result, the economic growth was proxy by the gross domestic product (GDP) while the capital market variables considered included market capitalization, all shares index, number of dealings, gross capital formation, exchange rate, value of all transaction and interest rate. This study is predated by the ineffectiveness of capital market which affects liquidity, acquisition of information about firms such as risk diversification, savings harmonization and corporate management. In lieu of this, the research adopted Auto-regressive Distribution Lag model and Bound Cointegration Testing. The results revealed that there is long run relationship between capital market and economic growth in Nigeria. To justify the findings, post estimation tests were conducted. For instance, the Jarque-Beta test suggest that the residuals for both models are normally distributed since the probability value is greater than 5% significant level. Hence, the hypothesis of normal distribution for residuals cannot be rejected. The Breusch-Godfrey Serial Correlation (LM) test re-affirms that the hypothesis of no autocorrelation can be rejected since the probability value is greater than 5% critical value. Henceforward, the study recommends that government should expand the market technological based in order to further improve transactions and dealings, which could enhance its internationalization and competitiveness. Also, regulatory body like security and exchange commission (SEC) should improve its supervisory roles towards reducing shoddy and unethical dealings in the Nigerian capital market.

Keywords: *Capital market, Economic growth, Security*.

JEL Classification: G11 O16 O43

INTRODUCTION

The overall growth of an economy depends on how efficiently and effectively her capital market performs, aided with smooth allocation and mobilization of funds. This is derived from it vital roles it plays through the appropriate fund channelization and

financial intermediation strength of the sector by linking the surplus resources to deficit resources sector of the economy that is mobilization and allocation of funds that are germane to local investment drive (Alile, 1984). Similarly, Osaze (2000) opined capital market as an in-built stabilizer of any nation to growth since capital formation via long-term loans are vital for economic growth. Also, Ekundayo (2002) posits that a nation need much of local and foreign investments to achieve sustainable economic growth and development. Drawing from this assertion, the security market offers several means through which this is achievable and this essential role is important in determining the aggregate growth of the economy.

However, macroeconomic instability and unorganized financial system which have retarded financial mobilization through saving and investment in Nigeria have been major concerns. Also, the paucity of long-term capital has created a demanding challenge to economic growth in several African countries, especially, Nigeria. In Nigeria for example, the ineffectiveness of capital market affects liquidity, acquisition of information about firms, risk diversification, savings harmonization and corporate management (Anyanwu, 1998) Capital market financing creates no short term repayment period as funds are held for medium and long term period or in infinity, funds to different tiers of government without pressures and sufficient time to repay loans. The current clamor for expansion of local investment to stabilize economic growth after the recent economic recession cannot therefore be overemphasized, and hence the relevance of this study at this essential period. In addition, with the previous consequential effect of poor capital market development which creates further problems for the nation's development particularly, the present scenario of economic recession that disrupts potential rise in Nigeria's economic growth.

Consequently, fewer attempts have been made in the past by previous scholars like Afeez & Kazeem (2010), Aremu, Suberu, & Ladipo (2011), Oke & Azeez (2012), Godfrey & Mutuku (2013) but with diverse views to unravel the ugly trend affecting economic in Nigeria. Going forward, it is pertinent in this study to focus on the problems rise from recent economic recession which disrupts growth stability. Interestingly, the noticeable problems stated were the motivating factors behind this study.

On this note, different questions have been raised which this research intended to answer. Firstly, following questions: what is the relationship between capital market and the Nigerian economic growth? Secondly, what is the direction of capital market trend on economic growth indicator? While, the objective of the study is to empirically investigate the relationship between capital market and economic growth in Nigeria. The outcomes from this study shall be of great value to both the government and policy makers based on the findings and recommendations this study may provide.

Furthermore, this study covers the period of 1980-2017, a period of thirty-seven years. This period is particularly pertinent for the study and the nation's economic history because it covers a period of deficit financing of long term projects as well as recessionary period in general which emanated as a result of low level of savings in Nigerian economy. Again, the choice of this period is necessitated by the undesirable macro-economic problems, economic distress and fluctuations that disrupts capital market liquidity flows.

This research is divided into five sections; section one encompasses the introductory aspect. Chapter two explains the conceptual, theoretical and empirical

literature review, while chapter three addresses the methodology, while chapter four encompasses the data representation and analysis. Whereas, chapter five therefore contains the conclusion, and policy recommendations.

LITERATURE REVIEW

Capital market is termed as complex institutions with diverse mechanisms through which intermediate term of trade and long term funds are polled. Notably, capital market is of different forms; the primary capital market and the secondary capital market. The primary market is the market for new issues that provide avenues to both government and corporate firms to rise fresh funds via securities issuance with general or selected group of investors subscribed from. While the secondary market is the market that offers the platform for sales and purchases of the already existing securities.

The relevant roles of the capital market in Nigeria

The roles of capital market in Nigeria cannot be over-emphasized. The following roles are mostly performed by capital market in the growth of the Nigerian economy include: (1) It allows prospects for companies to secure funds needed for long-term investment drives; (2) It creates avenue for the marketing of securities (e.g. shares, bonds etc.) so as to raise fresh funds for development of operations that brings about increase in output/production; (3) It paves ways for allocation of the nation's real and financial resources between various industries and companies. That is, via the capital formation and allocation device to the capital market which guarantees an efficient and effective supply of the scarce funds for the optimal benefit to the economy; (4) It lessens the over dependence of the corporate sector on short term financing for long term projects and also provides ways for government to finance projects aimed at providing essential amenities for local investors; (5) The capital market boosts the government efforts in its privatization drives by given her shares in the public enterprises to members of the public through the stock exchange; (6) The capital market also encourages the foreign capital inflow when foreign companies or investors invest in domestic securities, and this provides needed seed money for productive capital development and acts as a reliable medium for broadening the ownership base of family-owned and dominated firms.

Capital market concepts

The Financial Market; this market can have termed as intermediary market through which necessary funds are been mobilized across the security market. The international market in recent years have grown over the world in a very fast pace. "The buoyant capital flows among the nation boundaries have raised the existing strength of the financial market domestically as well as internationally" (Aremu et al, 2012). In Worldwide perspectives, particularly the financial markets are mainly affected by the hedge funds. The use of hedge funds has allowed the trading activities with large number of dealers. Notably, traditionally the banks were tasked with lending and receiving deposits. In the recent times, financial market among the countries over the world are the main area of concerns in the financial activities with execution of large deposits to the security market. Meanwhile, the financial markets can be divided into money and capital market.

Money markets are Markets for borrowing and lending funds for short-term

investment. The securities in a money market can be government bonds, Treasury bills and commercial paper from banks and companies.

The market is neither not a place nor a particular spot, however, it is the continuous buying and selling of short-term securities or liquid for investments. That is, trading of vastly liquid, short-term assets and securities, for example, treasury bills and commercial paper. Investors could trade on the money market either inform of an exchange or over-the counter.

The capital Market on the other hand is a market where long term funds are source by both government and companies to trade securities on the bond and the stock market. The market comprises of both the primary market where new liquidities are distributed among investors, and the secondary markets where already existing securities are bought and sold. Notably, mortgages, bonds, equities and other securities are traded in the capital market, and these liquidities serve as investment funds. The market also mobilizes funds from scarce spots to excess spots i.e. it creates the process whereby investors with much funds would able to channel them to investors in deficit.

Stock market key indicators

Market Capitalization Ratio (MCR): This is equals to the values of all listed shares divided by GDP. This is believed that it estimates the overall market size which is positively associated with the ability to diversify risk and mobilize capital on an economy-wide basis.

Total Value of Shares Traded Ratio (STR): This is equals to total values of shares traded on the floor of stock market exchange divided by GDP. The total value traded ratio estimates the systematized trading of firm equity as a share of country's produce which hence positively reflect liquidity on an economy-wide basis. This is used to complements the market capitalization ratio: although a market may be big, there might be little trading.

Turnover Ratio (TR): Turnover ratio equals the values of total shares traded divided by market capitalization. Nonetheless it is not a straight method of theoretical definitions of liquidity, high turnover usually used as a pointer of low operation costs. The market capitalization ratio is being complemented by turnover ratio. A large which is inactive dealings would have a huge market capitalization ratio but a small turnover ratio. Turnover also complements the total value traded ratio. Whereas, the total value traded ratio captures trading relative to the size of the economy, turnover captures trading relative to the stock market size. A small total value traded ratio sets in when a small liquid market has a high turnover ratio.

Related growth theories

Several theoretical contributions have been made as regards the subject matter of capital and economic growth. These theories are of relevance to this study as they serve as a foundation to this research work and as such the following theory will be discussed; Solow-growth model.

The Harrod-Domar Growth Model

Every economy must save a certain proportion of its national income, if only to replace worn-out or impaired capital goods (buildings, equipment, and materials).

However, in order to grow, new investments representing net additions to the capital

stock are necessary. If we assume that there is some direct economic relationship between the size of the total capital stock, K, and total GNP, Y—for example, if $3 of capital is always necessary to produce a $1 stream of GNP—it follows that any net additions to the capital stock in the form of new investment will bring about corresponding increases in the flow of national output, GNP. Suppose that this relationship, known in economics as the capital-output ratio, is roughly 3 to 1. If we define the capital-output ratio as k and assume further that the national savings ratio, s, is a fixed proportion of national output (e.g., 6%) and that total new investment is determined by the level of total savings, we can construct the following simple model of economic growth:

Saving (S) is some proportion, s, of national income (Y) such that we have the simple equation

$S = sY$ ……………………………………………………………………… (1)

Net investment (*I*) is defined as the change in the capital stock, *K*, and can be represented by ***Δ****K* such that $I = \Delta K$ …………………………………………………………. … (2)

But because the total capital stock, *K*, bearsa direct relationship to total national income or output, *Y,* as expressed by the capital-output ratio, *k*, it follows that

$K/Y = kOR\ \Delta K/\Delta Y \text{OR } K/\Delta Y$

Or, finally,

$\Delta K = \Delta k\ \Delta Y$ …………………………………………………………………. (3)

Finally, because net national savings, *S*, must equal net investment, *I*, we can write this equality as $S = I$ …. ………………………………………………………………… (4)

But from Equation 1 we know that *S* =***Δ****sY* and from Equations 2 and 3 we know that

$I = \Delta K = k\Delta Y$ ……………. . ……………………………………. . … . ………………… (5)

It therefore follows that we can write the "identity" of saving equaling investment shown by Equation 2.4 as $S = sY = k\Delta Y = \Delta K = I$ ……………………………………. ………… . . (6)

Or simply as $sY = k\Delta Y$ …… . . ……………………………………………………… . … . . (7)

Dividing both sides of Equation 7 first by *Y* and then by *k,* we obtain the following expression:

$$\frac{\Delta Y}{Y} = \frac{s}{k} \text{ ……………………………………………………………………… (8)}$$

Note that the left-hand side of Equation 8, ***Δ****Y*/*Y,* represents the rate of change or rate of growth of GNP (i.e., it is the percentage change in GNP). Equation 8, which is a simplified version of the famous equation in the Harrod-Domar theory of economic growth,2 states simply that the rate of growth of GNP (***Δ****Y*/*Y*) is determined jointly by the national savings ratio, *s,* and the national capital-output ratio, *k*.More specifically, it says that in the absence of government, the growth rate of national income will be directly or positively related to the savings ratio (i.e., the more an economy is able to save—and invest—out of a given GNP, the greater the growth of that GNP will be) and inversely or negatively related to the economy's capital-output ratio (i.e., the higher *k* is, the lower the

rate of GNP growth will be). The economic logic of Equation 8 is very simple. In order to grow, economies must save and invest a certain proportion of their GNP. The more they can save and invest, the faster they can grow. But the actual rate at which they can grow for any level of saving and investment—how much additional output can be had from an additional unit of investment—can be measured by the inverse of the capital output ratio, *k*, because this inverse, 1/*k*, is simply the output-capital or output investment ratio. It follows that multiplying the rate of new investment, $s = I/Y$, by its productivity, 1/*k*, will give the rate by which national income or GNP will increase.

The Solow Growth Model

The Solow-Swan model is an economic model of long-run economic growth set within the framework of neoclassical economics. It attempts to explain long-run economic growth by looking at capital accumulation, labor or population growth, and increases in productivity, commonly referred to as technological progress. At its core is a neoclassical (aggregate) production function, often specified to be of Cobb–Douglas type, which enables the model "to make contact with microeconomics. The model was developed independently by Robert Solow and Trevor Swan in 1956, and superseded the Keynesian Harrod–Domar model.

Mathematically, the Solow–Swan model is a nonlinear system consisting of a single ordinary differential equation that models the evolution of the per capita stock of capital.

The Solow growth model is built on a closed economy which makes use of labour and capital as its means of production. Under this scenario the implication of capital stocks on growth can be seen through its effect on the domestic saving which in turn used as investment in a closed model. Those countries which transfer revenue from export earnings which can be used in investment in the economy to avoid huge growth and will discourage public investment. This in turn will decrease economic growth and will shift both the investment and production function curves in Solow growth model downward (Adedoyi, Babalola, Otekunri, & Adeoti, 2016).

Consequently, in Solow's model, other things being equal, saving/investment and population growth rates are important determinants of economic growth. Higher saving/investment rates lead to accumulation of more capital per worker. In the absence of technological change and innovation, an increase in capital per worker would not be matched by a proportional increase in output per worker because of diminishing returns. Hence capital deepening would lower the rate of return on capital.

Review of the empirical literature

Aremu, Suberu, & Ladipo, (2011) argue across four different measures that were combined into a single index of capital market development through component analysis, while market financial depth is being as control. The study reveal that capital market development has inverse relationship with economic growth and significant long run impact on growth process in Nigeria. While, Donwa & Odia, (2010) examines the empirical impact of Nigerian stock market on economic between 1981 and 2008. The study employed ordinary least square (OLS) and it was reveal that Nigeria's capital market does not have significant impact on the economic growth. In view of this, the scholars recommended that investors' confidence should be stemmed along with activities

at the stock market in order to make security market contribute significantly to economic growth in future. Meanwhile, Babalola & Adegbite (2001) in their study of the performance of the Nigerian capital market since deregulation in 1986, submits that the Nigerian capital market is shallow and it is without expected variety, through rigorous discussion on financial delivery, financial service that centered on evolution, performance and prospects. Although, it was argued that market prospects are bright based on the recent efforts of government towards commercialization and privatization drive of enterprises but the authors recommended that government need to appropriate regulatory framework inform of investors guide so as to attain growth objectives through continuous provision of long term funds for productive services.

Bekaert & Harvey, (1997) study the link between financial market and economic growth with much emphasis on capital market and stock market integration through ranked order correlation and it discovered that projects in capital market have higher discount ratio since required rate of return is linked to local market volatility. Therefore, the study suggests that openness of the small open economy is positively correlated to economic growth. Whereas, Godfrey & Mutuku (2013) investigated the nexus between national output and internal borrowing in Kenya, through sophisticated statistical approach between from 2000 to 2010. The unit root test of Augmented Dickey, cointegration and ARDL bound testing techniques. The results indicate that increase in internal borrowing via capital market improves economic growth. As a result, the findings suggest an increase in borrowing through capital market, in as much as it is channeled towards productive investment.

While, Osuala, Okereke, & Nwansi (2013) work from different economy with different perspectives. In their study, which was based on stock market performance and economic growth in Nigeria. The findings reveal that stock market really enhance economic, using the general-to-specific Autoregressive Distributed Lag (ARDL) /bound testing approach. The study hence suggests that regulatory authorities should reactivate the interest of both local and foreign investors in order to sustain growth. In the same vein, Nurudeen (2009) posits that stock market development guarantee economic growth in Nigeria. The study employs error correction approach, which reveal that market capitalization-GDP ratio influences economic growth. And the author therefore suggests that removal of impediments such as tax, legal requirements from the stock market is necessary and the nation's infrastructure should be improved in order to create an enabling environment for the market to operate smoothly.

In so far, most of the previous works were not specifically designed to examine the impact of capital market on the Nigeria economic growth in both narrow and broader terms concurrently, rather they either addressed the phenomenon in narrow term or broader term, the few ones that attempted to address it instantaneously were not based on the Nigeria economy e.g. Godfrey & Mutuku (2013). Hence, it is pertinent to proceed on this study at this critical period.

METHODS

Over the years, different methodological approaches have been explored by previous authors. Hence, this study intends to investigate the nexus between capital

market and economic growth in Nigeria between 1980 and 2017 through descriptive statistical analysis, auto-regressive distribution lag model and Bound Cointegration Testing (Nurudeen, 2009; Osuala, Okereke, & Nwansi, 2013). Also, post estimation tests were conducted to know whether econometric estimation of the parameters has theoretical backing and statistically significant. Going forward, the study attempts to explain long-run economic growth through the Solow growth model is an economic model via capital accumulation, labor or population growth, and increases in productivity, which is commonly referred to as technological progress (Solow, 1956).

Where, $Y = F(K, L, T)$ ……. (9)

Y = output, K = Capital input, L = Labor input, T=Technical Progress.

The model in equation (9) is therefore specified

$Y = f(K, L, T)$ …… (10)

Introducing the explanatory variable of capital market, the model in equation (10) above is hereby specified as

$Y = f(MCP, GCF)$ …… (11)

Where MCP denotes market capitalization, GCF explains the gross capital formation and other regreesors to be included in the model are exchange rate (EXR), interest rate (INT), all shares index (ASI), and number of deals (NDL).

RGDP= $f(MCP, GCF, EXR, INT, ASI, NDL, VAT)$ …… (12)

So that we have the model in its transformed state as:

$Y = \beta_0 + \beta_1 MCP + \beta_2 GCF + \beta_3 EXR + \beta_4 INT + \beta_5 ASI + \beta_6 NDL + \beta_7 VAT + \mu$...(13)

Where:

Y=Real Gross Domestic Product, MCP=Market Capitalization, GCF=Gross Capital Formation, EXT=Exchange Rate, INT=Interest Rate, ASI =All Share, NDL=Number Deals, VAT=Value of All Transaction, μ = Stochastic error term, $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6$, which implies the slope of the regression equation.

The model is specified of its log-linear form:

Log RGDP = $\beta_0 + \beta_1 logMCP + \beta_2 logGCF + \beta_3 EXR + \beta_4 INT + \beta_5 logASI + \beta_6 logNDL + \mu$ …… (14)

Notably, series were logged due to large nature of some numbers especially Real Gross Domestic Product (RGDP) and Gross Capital Formation (GCF).

RESULT AND DISCUSSION

In this section, the study presents data analysis and the results. It begins with descriptive statistics followed by the trend analysis of capital market indicator(s) on real gross domestic product.

Descriptive statistics

Descriptive statistics shows the qualities of the data that are been used for estimation, the knowledge of which allow us to define the appropriate methodology for estimation. The Table 1 summarize the descriptive statistics.

Table 1. Summary of the variables

	GDP	ASI	EXC	INT	NDL	VAT	MCP	GCF
Mean	3.208542	17684.47	82.66459	0.038366	985343.9	360053.1	2781.623	38.20338
Median	4.230061	6992.1	92.3381	3.023542	123509	14072	302.5825	37.23967
Maximum	15.32916	173285.8	305.7901	18.18	12112690	2350876	13226	89.38105
Minimum	-13.12788	10.4000	0.617708	-65.85715	10014	215	1.2	14.90391
Std. Dev.	5.610974	30119.77	80.3356	14.95721	2095995	570043.4	3998.123	19.1784
Skewness	-15.32916	3.89932	0.717369	-2.538242	4.26444	1.781894	1.3071	0.894633
Kurtosis	4.453574	20.49326	2.879241	11.58989	22.81296	5.748037	3.364433	3.513784
Jarque-Bera	8.012825	565.5341	3.195963	153.4834	717.3302	31.22229	10.74057	5.342565
Probability	0.018199	0.0000	0.202304	0.0000	0.0000	0.0000	0.004653	0.069163
Sum	118.7161	654325.4	3058.59	1.419531	36457725	13321963	102920.1	1413.525
Sum Sq. Dev.	1133.389	3.27E+10	232337.1	8053.857	1.58E+14	1.17E+13	5.75E+08	13241.19
Observations	37	37	37	37	37	37	37	37

From the Table 1, GDP represents Gross Domestic Product, ASI represents all share index, EXC denotes exchange rate, INT denotes interest rate, and NDL means number of deals, VAT symbolizes value added tax, MCP explains market capitalization and GCF implies gross capital formation. The estimated mean value is been used to examine the pattern of distribution and the figures values for GDP ASI EXC INT NDL VAT MCP and GCF are 4.230061, 6992.1, 92.3381, 3.023542, 123509, 14072, 302.5825 and 37.23967 separately. The results also reveals that the standard deviation showed that ASI NDL, VAT and MCP 30119.77 2095995, 570043.4 and 3998.123 demonstrates high variability, while GDP, EXC, INT and GCF show low variability.

In conclusion, all the variables under this study are widely dispersed around their means indicating that they are grossly affected by their extreme value. ASI EXC NDL VAT MCP and GCF has positive skewness while GDP and INT are negatively skewed. Kurtosis is either flat or peak of the normal curve. It measures of the "tailedness" of the probability distribution of a real-valued random variable. It is normal distribution and mesokurtic if kurtosis equal 3, platykurtic if kurtosis less than 3 and leptokurtic if kurtosis greater than 3. In the study, all series were leptokurtic in their distribution except EXC that is platykurtic. Jarque-Bera is used to test whether the estimates are normally distributed or not. It is observed that 5% level of insignificant indicates that the residuals are normally distributed.

It can be observed from the harmonized curve that over the years, number of dealings in capital market and all share index rise sporadically on gross domestic products compared to other series like exchange rate, gross capital formation, market capitalization and volume of trade that disclose smooth and steady movement on gross domestics products.

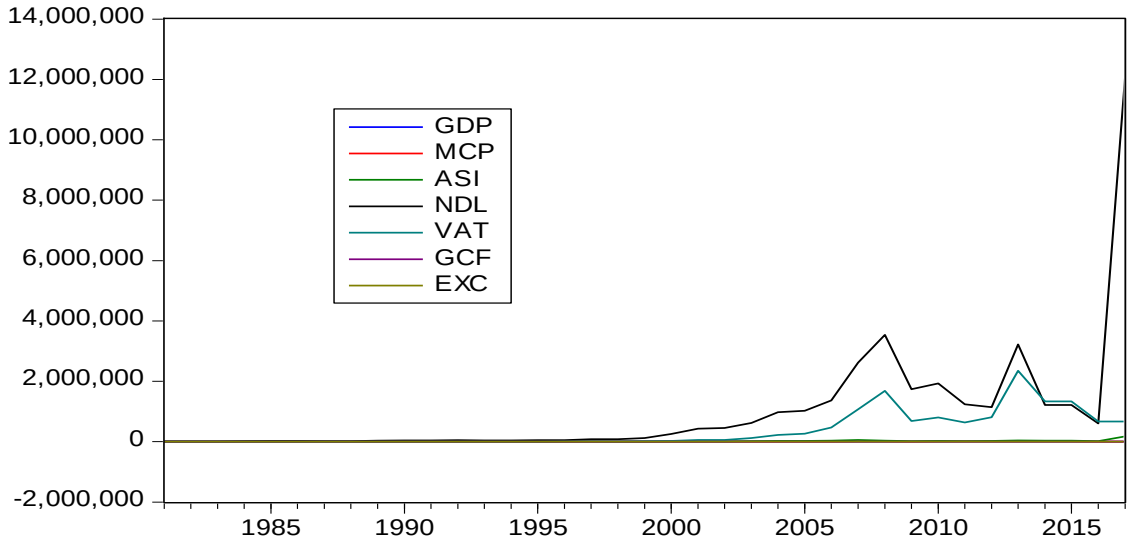

Figure 1. The trend analysis (harmonized curve)

The categorical curves explain the individual specifics of the series employed in the study. The GDP curve shows moderate movement over time, while series like MCP, ASI, NDL, and EXC disclose slow start but later rise spontaneously over the years. Meanwhile, GCF rise initially but later drastically drop later on.

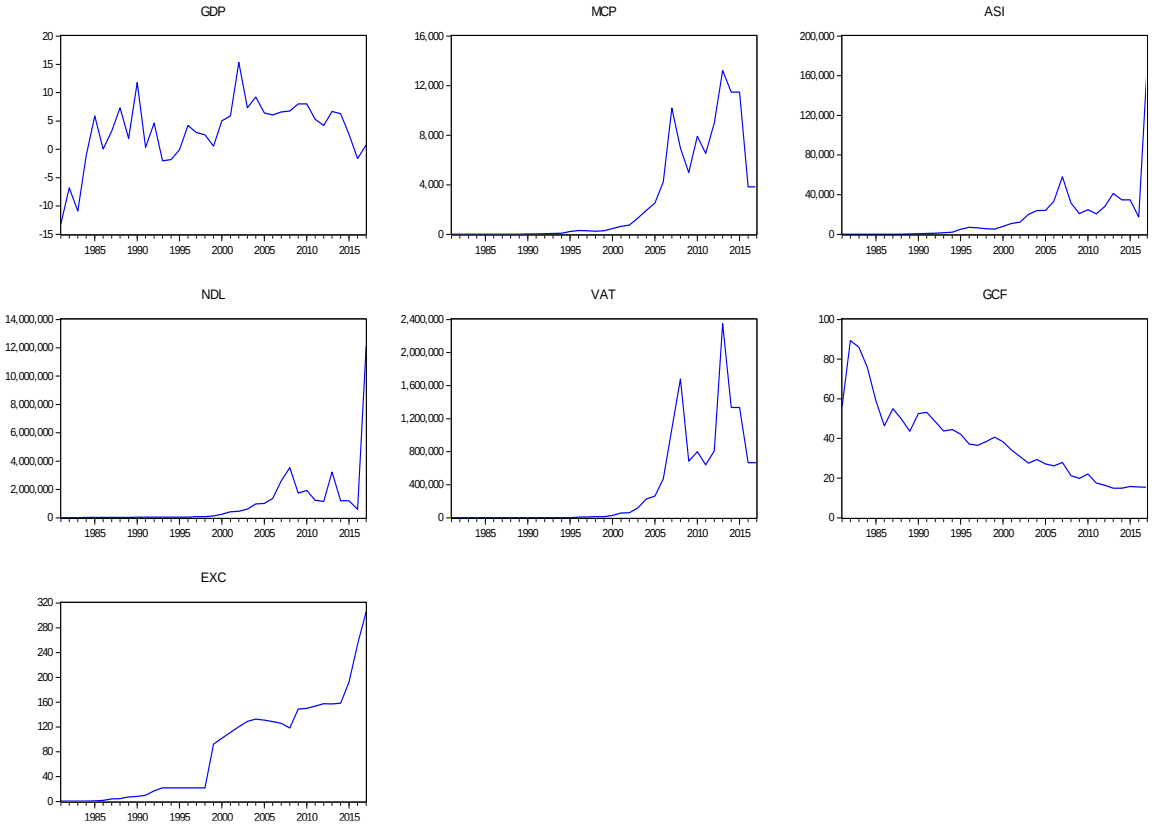

Figure 2. Categorical curve

From Table 2. unit root and statistical attributes of all the series were tested. It shows the estimates of level and first difference of the variables in the model. The null hypothesis states that there is a unit root in each of the series that is each variable is non stationary.

Table 2. Unit root test

Unit root test	ADF T-Statistics	Order of integration
GDP	-4.045483	I(0)
ASI	-4.278503	I(1)
EXC	-3.297372	I(1)
INT	-7.068039	I(0)
NDL	-4.058280	I(1)
VAT	-7.620459	I(1)
MCP	-6.204511	I(1)
GCF	-5.530699	I(1)

Intuitively, the null hypothesis cannot be rejected if the ADF statistic is greater than critical value at various significance levels. Augmented Dickey Fuller reveals that GDP and INT are integrated at level I (0), while series of ASI, EXC, NDL, VAT, MCP, and GCF. This kind of conflict between the outcomes of the two tests is common in practice (Rahman, 2012). Based on the mixed ADF test results, the condition for Auto-Regressive Distributed Lag (ARDL) and Bound cointegration testing are met.

ARDL analysis

This subsection presents the result obtained from estimating the ARDL unrestricted error correction (short run or dynamic) model and the ARDL short run (static) model in equation. Following this result, this study examines and estimates both short-run dynamics and the long-run relationships between gross domestic products, all share index, interest rate, and number of deals, market capitalization, exchange rate and gross capital formation.

Table 3. ARDL coefficient

Variables	Coefficient	Std. Error	t-Statistic	Prob.
D(LOG ASI)	1.75E-05	4.21E-05	0.415287	0.6813
ASI(-1)	-0.000177*	0.000127	-1.388744	0.0767
EXC(-1)	-0.039751	0.041162	-0.965725	0.3431
INT(-1)	0.026805**	0.061335	0.437028	0.0294
LOGNDL(-1)	4.501125*	2.39939	1.875946	0.0719
LOGVAT(-1)	0.040172	1.334997	0.030092	0.9762
LOGMCP(-1)	-0.564331	1.121217	-0.50332	0.6190
LOGGCF(-1)	1.224539	4.651449	0.26326	0.7944
LOGGDP(-1)	-0.813671***	0.2129	-3.821852	0.0007
C	-47.45991*	27.4222	-1.730711	0.0954

Figures in parenthesis indicates (*) (**) (***) for 1%, 5% and 10% level of significance respectively.

Bound test

It is used to test the presence of long-run equilibrium between the series. Based on the mixed outcome, it is pertinent to investigate long-run presences in the model. Thus, given the unit root test result above, the most appropriate co-integration test is the Pesaran Bounds test since the test allows combination of fractionally integrated variables i.e. combines variables of different orders of integration. The Bounds Cointegration test result is provided thus:

Table 4. ARDL bounds test

Test Statistic	Value	k
F-statistic	4.635011	5
Critical Value Bounds		
Significance	I(0)Bound	I(1)Bound
10%	2.03	3.13
5%	2.32	3.50
2.50%	2.60	3.84
1%	2.96	4.26

Source: Author's calculation.

Bounds test, the result above shows that the assumption of null hypothesis of no long-run relationship can be rejected, as the F-statistics estimates fall out the upper bound across the various level of significance. The F-statistic for the model is greater than 1%, 5% of both I (0) and I (1) bounds of 2.96 and 3.50 respectively. Thus, this confirms the existence of long-run relationship between real gross domestic products, all share index, interest rate, and number of deals, market capitalization, exchange rate and gross capital formation.

Long-run ARDL and Error Correction Model analysis

It is confirmed from the result that there is a positive relationship with interest rate past number of deals and previous year gross domestic products significant at 1%, 5% and 10% respectively. The co integration equation is:

$$Cointeq = LOGGDP - (-0.0003 * ASI - 0.0458 * EXC + 0.0989 * INT + 6.5135 * LOGNDL - 1.2503 * LOGVAT - 0.6097 * LOGMCP - 5.1950 * LOGGCF - 34.1743)$$

When co integration exists, the Engle-Granger Theorem establishes the encompassing power of the error correction mechanism over other forms of dynamic specifications. The next section reports the results of the Error Correction Mechanism.

Table 5. ARDL ECM

Variables	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(ASI)	-0.000107**	0.000049	-2.188634	0.0378
D(EXC)	-0.04478*	0.025623	-1.747659	0.0923
D(INT)	0.096609	0.076105	1.269412	0.2155
D(LOGNDL)	6.36512***	2.034601	3.128437	0.0043
D(LOGVAT)	-1.221797	1.18076	-1.034755	0.3103
D(LOGMCP)	-0.595856	1.235426	-0.482308	0.6336
D(LOGGCF)	-5.07664***	4.80264	-1.057052	0.0032***
CointEq(-1)*	-0.97722***	0.181198	-5.393114	0.0000***
R-squared	0.782838	Mean dependent var		3.662332
Adjusted R-squared	0.762638	S.D. dependent var		4.954355
S.E. of regression	3.701278	Akaike info criterion		5.685366
Sum squared resid	356.1858	Schwarz criterion		6.125233
Log likelihood	-92.33659	Hannan-Quinn criter.		5.838891
Durbin-Watson stat	2.271296			

Figures in parenthesis indicates (*) (**) (***) for 1%, 5% and 10% level of significance respectively.

Table 6. Diagnostic test result

Test	F-Stat (Prob)
Jarque-Bera test	3.477247 (0.175762)
Breusch-Godfrey test	0.515344 (0.8500)

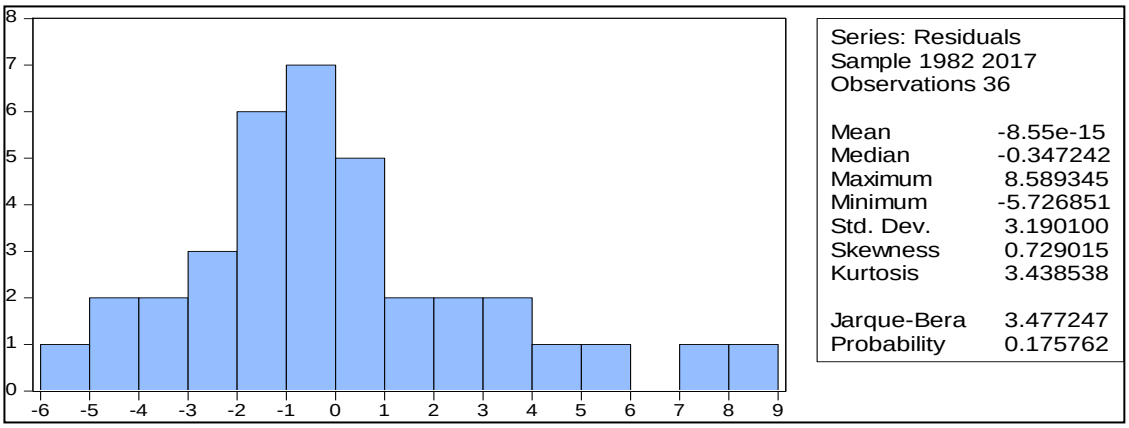

Figure 3. Normality curve

Discussion

From Table 3, it can be observed that previous year of ASI, INT, NDL and GDP are statistically significant. Meaning that previous years activities of the variables predicts present year's effects on economic growth in Nigeria. It is worthy to note that the series in the model have short run significant impact on the Nigeria's economic, that capital market indicators have significant effect on the economic growth of Nigeria. However, series like current All share index, previous value of share traded, previous and previous gross capital formation are all positive to current gross domestic products, except for exchange rate and market capitalization which are negative and not statistically significant. Meanwhile, Donwa & Odia, (2010) examines the empirical impact of Nigerian stock market on economic between 1981 and 2008. The study employed ordinary least square (OLS) and it was reveal that Nigeria's capital market does not have significant impact on the economic growth.

Interestingly, the Bound test estimates established the presence of long run relationship between the series in the model. The higher F-statistics which is greater than both lower and upper bound critical value disclose that long run analysis is pertinent in this study. The results from long run form model further reveal that capital market has long run significant impact on economic growth in Nigeria.

The cointegration test for the long run relationship reveals that capital market has significant impact on the Nigeria's economic growth through all share index, exchange rate, number of deals, and gross capital formation. Furthermore, the series disclose different level of significance ranges from 1% to 10%. For example, 1 percent rise in all share index brings about 0.01 percent fall in economic growth, while 1 unit rise in number of dealings at the capital market brings about 636.5 units rise in economic growth. A unit rise in gross capital formation brings about 507.6 units fall in economic growth verse

versa.

Notably, the error correction mechanism results disclose that there is link between the short run and long run effects of capital market on economic growth in Nigeria. This portrays the speed at which level of disequilibrium recon verge from the short run disruption to long run at the rate of 97.7%. This rate indicates how quick the model readjusted over time and at a very high speed. The R-square explains the level of determination in the model, that is, it is used to measure the level at which independent variables explain the dependent variable over the period under discussion. R-square simply refers to as co-efficient of determination reveals that 78 percent of the gross domestic is explained by the regressors which means that our model is good and fit for the analysis. The Durbin-Watson statistic shows that there is not auto-correlation in the model adopted at 2.

After estimating the short and long-run analysis, it is required to verify whether our results are valid and in line with the OLS technique assumptions, that is, how efficiency and consistency are the results estimated so far within the model. From Table 6, Jarque-Beta test suggest that the residuals for both models are normally distributed since the probability value is greater than 5% significant level. Hence, the hypothesis of normal distribution for residuals cannot be rejected. The Breusch-Godfrey Serial Correlation (LM) test re-affirms that the hypothesis of no autocorrelation cannot be rejected since the probability value is greater than 5% critical value. The normality test reveals that the series are normally distributed.

CONCLUSION AND RECOMMENDATION

Conclusion

In so far, the study explored nexus between capital market and economic growth in Nigeria, from 1980 to 2017 through annual time series data. This study addresses different questions being raised in the cause of the research. It is interesting to note that the study made use of ARDL and Bound Cointegration techniques to explain the long-run and short-run relationship between capital market and economic growth in Nigeria. Remarkably, the Bound test was used to investigate whether there is long-run co-integration and it revealed that the variables co-integrated in the long run.

Having empirically sought for the link between capital market and the Nigerian economic growth between 1980 and 2017, it is predominantly concluded that long-run and short-run relationship between capital market and economic growth in Nigeria subsist. Meaning that that capital market has significant effects on the Nigerian economic growth during the years under review, which corroborate the views of Osuala, Okereke, and Nwansi (2013), Afees, and Kazeem, (2010).

Recommendation

Drawing from the current revelations, this study henceforward, recommends that government should expand the technological based of the Nigerian capital market in order to further improve transactions and dealings, which could enhance internationalization and competitiveness of the market. Also, regulatory body like security and exchange commission (SEC) should improve its supervisory roles towards reducing shoddy and unethical dealings in the Nigerian capital market.

REFERENCES

Adam, J. A., & Sanni, I. (2005). Stock Market Development and Nigeria's Economic Growth. *Journal of Economics and Allied Fields*, 2(2), 116-132.

Adedoyi, L.I, Babalola, M.B, Otekunri, A.O, & Adeoti, J.O. (2016) External Debt and Economic Growth: Evidence from Nigeria. *Acta Universitatis Danubius*, 12 (6), 179-194.

Afees, A.S & Kazeem, B.A (2010). The Stock Market and Economic Growth in Nigeria: An Empirical Investigation, *Journal of Economic Theory*, 4, 65 – 70.

Aremu, O. S. Suberu, O. J. Ladipo, & O.O. (2011) Impact of the Nigerian capital market operations on the local investments in Nigeria. *Journal of Research in International Business Management*, 1(8), 258-261.

Alile, H.l (1984). *The Nigerian Stock Exchange: Historical Perspectives, operations and Contributions to Economic Development*, Central Bank of Nigerian Bullions 2: 6S-6Q.

Anyanwu, J.C (1993). *Monetary Economics Theory, Policy and Institutions*. Onitsha: Hybrid Publishers Ltd., pp. 247 – 27.

Banerjee, V.A (2001) *Contracting Constraints, Credit Markets and Economic Development*. Department of Economics MIT, 1-55.

Babalola, J. A. & Adegbite, M. A. (2001). The performance of the Nigerian capital market since deregulation in 1986. *Economic and Financial Review*, 39(1), 1–19.

Bekaert, G., & Harvey, C.R. (1997): Emerging equity market volatility. *Journal of Financial Economics* 43, 29-78.

Capital Market Authority (2008). *To regulate and promote a robust, transparent, fair and efficient capital market in Uganda*. Annual report: 30 June 2008.

Donwa J.P. & Odia J. Odia (2010) An Empirical Analysis of the Impact of the Nigerian Capital Market on Her Socio-economic Development. *Journal of Social Sciences*, 24(2):135-142.

Ekundayo, K. (2002). *The Nigeria capital market report on operational activities*. CBN Annual Report account Central Bank of Nigeria Publication the capital market and its impact on the growth of the Nigerian economy. 25(1), 11

Engle, R.F. & Granger, C.W.J. (1987) Cointegration and Error Correction Representation, Estimation and Testing. *Econometrica*, 55(2), 252-276.

Ewah, S.O.E, Esang, A.E. & Bassey J.U. (2009). Appraisal of Capital Market Efficiency on Economic Growth in Nigeria. *International Journal of Business and Management*, 4 (12), 219 – 225.

Ewan D (2009). Stock prices and exchange rate interactions in Nigeria. *IUP J. Fin. Econ.* 2, 40-43

Godfrey, K.P. & Cyrus, M.M. (2013) Domestic Debt and Economic Growth Nexus in Kenya, *Current Research Journal of Economic Theory*, 5(1), 1-10

Granger, C. W.J. & P. Newbold. (1977). *Forecasting Econometric Time Series*. New York: Academic Press.

Hamid, M. & Sumit, A. (2007). *Stock Market Development and Economic Growth: Evidence from Developing Countries*. University of Wisconsin- Milwaukee, WI 53201.

Levine, R. (1991). Stock Markets, Growth, and Tax Policy. *Journal of Finance*, XLVI, 1445-1465.

Levine, R. (1997). Financial Development and Economic Growth: Views and Agenda. *Journal of Economic Literature*, XXXV, 688-726.

Levine R, & Zervos, S. (1998). Stock Market Development and Long–run Growth. *American Economic Review*, 88(3), 537- 558.

Muhammed, S., Nadeem, A., & Liaquat, A. (2008). Stock Market Development and Economic Growth: ARDL Causality in Pakistan. *International Research Journal of Finance and Economics*, 14,.183- 195.

Nurudeen, A. (2009). Does stock market development raise economic growth? Evidence from Nigeria. *The Review of Finance and Banking*, 1(1), 015-026.

Nyong, M.O. (1997). Capital Market Development and Long-run Economic Growth: Theory, Evidence and Analysis. *First Bank Review*, 13-38.

Oke M.O. & Azeez B.A. (2012) A Test of Strong-Form Efficiency of the Nigerian Capital Market. *Business Systems review*, 1(1), 10-26.

Okereke, O. (2000). A critical study of the difference between capital market development and economic growth in Nigeria. *SEC publication 1997*, 2-4.

Omole, D.O. (1997). *Efficient market hypothesis and the Nigerian capital market under financial liberalization: An empirical analysis*. (Unpublished PhD Thesis), University of Ibadan, Nigeria.

Osaze B.E. (2000). *The Nigerian Capital Market in the African and Global Financial System*. Benin City: Bofic Consults Group Limited.

Osinubi, T. S., & Amaghionyeodiwe, L.A. (2003). Stock Market Development and Long-run Growth in Nigeria. *Journal of African Business*, 4 (3), 103-129.

Osuala, A. E, Okereke, J.E & Nwansi, G.U. (2013) Does stock market development promote economic growth in emerging markets? A causality evidence from Nigeria. *World Review of Business Research*, 3(4), 1-13.

Odetayo T.A & Sajuyigbe A.S. (2012) Impact of Nigerian capital market on economic growth and development. *International Journal of Arts and Commerce*, 1(5), 1-8.

Solow, R. M. (1956). A contribution to the theory of Economic Growth. *Quarterly Journal of Economics*, LXX(70), 65-99.

Soyode A (1990) The role of capital market in economic development. *Security Market Journal*, 6(2).

Osinubi, T.S. (2002) Does Stock Market Promote Economic Growth in Nigeria? Available at: https://www.semanticscholar.org/paper/Does-Stock-Market-Promote-Economic-Growth-In-Osinubi/08ca7e476f50076c284920d2e4c32bb821d12bf2

Development on the leading small and medium-sized industry (SMI): food industry in Jambi Province

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Abstract

The objectives of this research are: 1). to analyze the factors which determine the production of leading small-medium food industry, 2). to analyze the effect of leading small-medium food industry production towards community income. The analysis models used are simultaneous equation model (ESM) and simple regression. The research results show that the determining factors on the production of leading small-medium food industry are investment, production capacity, labor, sales, and the utilization of technology simultaneously. However, individually, the sales have significant influence on the production of leading small-medium food industry in which determined by promotion and market share. In addition, the influence of leading small-medium food industry is very significant on community income with a contribution of 59.54%. The amount of public income in the leading small-medium food industry is IDR 1.5 million for a single production period of 1.5 months or approximately IDR 1 million per month.

Keywords: *Food, Industry, Income*

JEL Classification: D24, O14, L66

INTRODUCTION

In the era of globalization, the level of competitiveness has been a definite benchmark in realizing free market competition in both the activities and trade of the world economy which is the principal of market forces. The development of competitiveness on a national and international scale is closely related to the level of competitiveness at the regional level (Jayanti & Musqorobin, 2017)

Industry is an economic activity that processes raw materials, semi-processed, or finished goods into high-value goods. Meanwhile, food is anything that comes from biological sources and water, whether processed or not processed and intended as food or drink for human consumption. These include food additives, food raw materials and, other materials used in the process of preparing, processing, and manufacturing food or drinks (Sobari, 2018).

At the macro level, the manufacturing sector is still the biggest contributor to the national economic structure. The contribution of the manufacturing sector to the Gross Domestic Product in 2019 is seen to be 19.52%. As for Jambi Province, the contribution of the manufacturing industry to the Gross Regional Domestic Product was 6.36%. This means that the contribution in processing industry in Jambi Province is less than the national contribution. Developing the manufacturing industry is therefore required to support regional economic development and expand employment and business opportunities.

In developing industrialization in the regions, the role of small and medium-sized industries is very significant. Data in 2018 shows that there are 30,456 units of Small and Medium-sized Industries in Jambi Province with an employment of 119,902 people and an investment value of 5,527,603,732 IDR. The existence of this small and medium-sized industry is crucial because it is capable of generating employment and encouraging investment growth in Jambi Province. Meirejeki (2016) states that it is necessary to select the industrial sector to determine which industries can be the leading sector as the basis for development.

As demonstrated by the number of small and medium-sized industries in Jambi Province as many as 30,456 units, the majority of these industries are dominated by the food industry. The food industry has a business unit of 11,917 units or 39.64% of the population of the small and medium industry in Jambi Province. The distribution of data for small and medium-sized industries in Jambi Province is based on Indonesian Standard Industrial Classification (ISIC) as described in the table below.

Table 1. Classification of Small-Medium Industry (SMI) in Jambi Province, 2018

Class	Number of unit	(%)
Food	11,917	39.64
Clothing	2,921	9.72
Metals and Electronics	3,976	13.23
Chemical and Building Materials	7,528	25.05
Crafts	3,714	12.36
Total	30,056	100.00

Source: Department of Industry and Trade, Jambi Province 2019

Table 1 illustrates the dominance of the food industry in Jambi Province in small and medium-sized industries. The chemical industry and building materials industry ranks second with 7,528 units or 25.05%. The food industry is noteworthy because it contributes 39.64% to the development of small and medium-sized industries in Jambi Province.

Specifically, the Jambi Province Department of Industry and Trade indicated that 115 units of leading food industries had been identified in Jambi Province. The food industries are then divided into five groups, as seen in the Table 2.

Table 2. Classification of Small-Medium Food Industry (SMI) in Jambi Province, 2018

Class	Number of unit	(%)
Bulbs	7	6.36
Fruits	26	23.64
Plantation Products	24	21.82
Seafood	20	18.18
Nuts	33	30.00
Total	110	100.00

Source: Department of Industry and Trade, Jambi Province 2019

In the development of the leading small and medium-sized food industries, production is also determined and it will entail the right strategy to accelerate the growth of the industry itself. Several factors can affect the industry, including investment, production capacity, labor, sales and use of technology. This theory is in accordance with the results of the research conducted by Yuvanda & Rosita (2018) which stated that investment and price variables affect the production of superior plantations. These factors will be input in developing small and medium-sized food industries. Determinant factor for small and medium-sized food industries is therefore required.

A strategy needs to be established from the acquisition of factors as the determinants of production of leading small and medium-sized food industry. The strategy seeks to ensure that the leading small and medium-sized food industry can accelerate the growth of leading small and medium-sized food industry. Guine, Ramalhosa & Valente (2016) who conducted research in Portugal with the title "New Foods, New Consumers: Innovation in Food Product Development" states that in the development of the food industry, products and processes are considered an important part of smart business strategies. The food industry must innovate in the area of production technology.

In addition, the growth of the leading small and medium food industry would also increase the added value of the industrial community. Increased public income is reflected in the rise in income as a factory owner, an increase in wages for labor, and profits as a business owner and the acquisition of margins in the input supply chain and product sales chain generated by the leading small and medium-sized food industry.

Based on the explanation given above, the objectives of this study are as: 1) to analyze the factors which decide the production of the leading small and medium-sized food industry; 2) to analyze the effect of the production of the leading small and medium-sized food industry on community income.

METHODS

The data to be used is derived from secondary data. The secondary data used came from the Jambi Province Industry and Trade Office. Based on the data, there are 110 small and medium-sized food industries in 2019.

Simultaneous Equation Model is used to responde to the first research objective, which is to determine factors that influence the development of small and medium-sized food industries identified as superior. Simultaneous equation model explores the relationship of independent variables to other variables.

This statistical model is used to avoid bias, inconsistency, and inefficiency when the ordinary least square is used. The multiple regression equation model is then estimated using Two Stage Least Square (TSLS). TSLS can solve the issue of bias, inconsistency, and inefficiency through 2 phases of calculation including:

Phase-I : Regressing independent variables with predetermined variables:

$$X_1 = f(X_{1.1}, X_{1.2}, \ldots X_{1.4}) \text{ and } X_2 = f(X_{2.1}, X_{2.2}, \ldots .X_{2.3})$$

Phase-II : Regresses the dependent variable by estimating the independent variable:

$$Y = f(X_1, X_2, X_3 \ldots\ldots\ldots\ldots X_8)$$

Mathematically, the factors that influence the production of the leading small and medium-sized food industries are formulated as follows:

$$PDS = a_0 + a_1IVS + a_2KPP + a_3\widehat{TKJ} + a_4P\widehat{GT} + a_5PJL + u_1$$

$$\widehat{KPP} = b_0 + b_1IVS + b_2PGT + u_2$$

$$\widehat{PJL} = c_0 + c_1PPS + c_2BPM + u_3$$

PDS	:	Production of the leading Small and medium-sized food industry
IVS	:	Investment
KPP	:	Production capacity
TKJ	:	Labor
PGT	:	Technology Utilization
PJL	:	Sales
PPS	:	Market share
BPM	:	Promotion Fee
$U_{1,}u_{2,}u3_3$	:	error term
a,b,c	:	regression coefficient

A simple regression model is used to meet the second research objective by analyzing the effects of the leading small and medium-sized food industry on community income using the following mathematical equations;

$$PDM = \alpha + \beta PDS + e$$

PDM	: Community Income
PDS	: Leading SMI Production (food industry)
α	: intercept
β	: Leading SMI Production (food industry) coefficient
e	: error term

From the formulation of the two models above, the variables used in the model can be operationalized. As for the operations, they are referred to:

1. Production is the total value of goods produced by the medium-sized, superior food industry, resulting from the production process of the industry in order to increase the added value measured in rupiah for one time production.
2. Investment is the amount of funds used for the development of superior small and medium-sized food industry businesses in order to gain profits measured in rupiah per year.
3. Production capacity is the maximum production that can be achieved from equipment used to produce goods by small and medium-sized food industry, measured in kilograms per year.
4. Manpower is the number of people who work for one time production in the small and medium-sized food industry.5. Use of technology is the amount of funds used by superior small and medium-sized food industries to purchase technology in the manufacturing process, measured in rupiah per year.
6. Sales are revenues generated by the leading small and medium-sized food industry from the sale of their goods, measured in rupiah per year.
7. Market share is the size of the market dominated by the leading small and medium-sized food industry in marketing their goods, measured in percentage (%) per year.
8. Promotion costs are funds spent on the promotion of goods produced by the leading small and medium-sized food industries, measured in rupiah units per year.
9. Community income is the salary/wages earned by the community for their work in the leading small and medium-sized food industry, measured in rupiah per month.

RESULTS AND DISCUSSION

The average production value for the 110 leading small and medium-sized food business units is 2.91 billion. The coffee processing industry has the largest average production, approximately 13.02 billion, while the average investment value is 49.89 million, with the marine fishery processing industry having the largest investment of 427.53 million. The average installed production capacity is 12,580.55 kg, with the coffee processing industry having the largest production capacity with an estimated production capacity of 21,900 kg. In addition, the leading small and medium-sized food industry can absorb an average of 5 workers per business unit with a total absorption capacity of 528 people for all industries.

On the other hand, the leading small and medium-sized food industries have total sales of 17.59 billion, with an average sale of 159.87 million for each business unit, while the marine fishery product processing industry has the largest sales with an average sale of 230.21 million. Meanwhile, for the overall use of technology, each business unit uses technology valued at 62.35 million, with the tuber processing industry providing the largest technology usage value, approximately 26.39 million. In terms of the market share, the tuber processing industry has the largest average market share of 14.29% and the legume processing industry only has an average market share of 3.03%. Meanwhile, the average promotional costs of the leading small and medium-sized industry is 10.82 million, with the coffee processing industry spending the most promotional costs of 21.20 million.

To analyze the determinants of production of the leading small and medium-sized industries (SMI), a simultaneous equation analysis model is used. Simultaneous equation uses 2 stages of analysis to generate a simultaneous equation.

First Analysis

Phase 1

Phase 1 analyzes the effect of investment (IVS) and the use of technology (PGT) on production capacity (KPP). The results of data processed by *Eviews* program are outlined in the following regression equation.

KPP = 2468,920 – 0,000370IVS + 0,001557PGT + e
Prob = (0,0000) (0,0000)
R^2 = 0.370826

Overall, the investment factor (IVS) and the use of technology (PGT) have a significant effect on production capacity (KPP) at P = 0.092135. While partially, these two factors also have a significant effect on production capacity (KPP), each at P = 0.0000. This means that investment (IVS) and the use of technology (PGT) both overall and partially greatly affect the production capacity at R^2 = 0.370826.

Phase 2

Phase 2 analyzes the effect of market share (PPS) and promotion costs (BPM) on sales (PES). The results of data processing are outlined in the following form of regression equation..

PES = - 21830777 + 5178518PPS + 14,61771BPM + e
Prob = (0,0063) (0,0000)

Overall, market share (PPS) and promotion costs (BPM) have a very significant effect (P = 0.0000) on sales (PES). While partially, both of these factors also have a very significant effect on sales (PES), each probability value is P = 0.0063 and P =

0.0000. Means that market share (PPS) and promotion costs (BPM) both have a very significant effect on sales (PES).

The effect of promotion on sales was also found in various previous studies, including Baidya & Ghose (2010), Darmadi, Suharyono, Latief (2013), Jasmani (2018). The promotion center will also be a hub for innovation for product development. Innovation is very important in the product development of the small and medium-sized industries (Saguy & Sirotinskaya, 2014)

Second analysis

The second stage of the analysis was carried out to analyze the influence of investment factors (IVS), production capacity (KPP), labor (TKJ), sales (PES), and the use of technology (PGT) on production (PDS) of leading food SMIs. The analysis in the second stage is carried out with the help of *EViews*. The results are outlined in the following regression equation.

PDS = -35394341 – 1,849IVS – 5075,919KPP + 9363172TKJ + 0,512PJL + 9,032PGT + e
Prob = (0,0988) (0,0636) (0,1075) (0,000) (0,0564)

KPP = 2468,920 – 0,000370IVS + 0,001557PGT + e
Prob = (0,0000) (0,0000)

PJL = -21830777 + 5178518PPS + 14,61771BPM + e
Prob = (0,0063) (0,0000)

Overall, investment factors (IVS), production capacity (KPP), labor (TKJ), sales (PES), and use of technology (PGT) have a very significant effect (P = 0.0000) on production (PDS). The contribution value of all factors affecting production (PDS) is 84.615% or R^2 = 0.846150

While partially, all of these factors also have a significant effect on production (PDS) but the probability varies. The sales factor (PES) has a probability P = 0.0000, meaning that sales have a very significant effect on individual sales. Investment (IVS) P = 0.0988, labor (TKJ) P = 0.1075, production capacity (KPP) P = 0.0636, and the use of technology (PGT) P = 0.0564 has a significant effect on sales (PES). This means, sales (PES) is very influential on the production of leading food industry, followed by the factor of technology use (PGT) and production capacity (KPP) which also influence the sales (PES).

The findings of this research are also aligned with the results of the research conducted by Hidayat (2005) which indicates that labor and investment have a significant effect on industrial development. However, there are also differences in findings as this research favored the sales factor as the greatest effect on production. Meanwhile, the results of research Hidayat (2005) favored the labor factor as the greatest effect on production. Furthermore, the influence of technology on production found in this study is also in line with several previous studies including Prakash & Sharma (2011), Ketema & Kassa (2016), Fauzi, Amir, Junaidi & Hidayat (2019)

In another part of the research findings, Hidayat & Rasjid (2019) also affirm the results of this study which indicate that labor affects the production of small and medium-sized industries. The results of this research are also supported by the results of research of Wibowo & Nugroho (2018) which states that labor also has a significant positive effect on industrial production.

In order to analyze the effect of the production of the leading small and medium-sized industries (SMI) on community income, a simple regression analysis model is used. The results of data processing are outlined in the following simple regression equation.

PDM = 353599,7 + 0,012985PDS
Prob = (0,0000)

The equation above shows that the production (PDS) of the leading food industry has a very significant effect on community income (PDM) at R2 = 0.595389. This means that the production of the leading food industry (PDS) has contributed to the income of those working in the sector (PDM) of 59.54%. This is understandable because the income is earned by working part time in the leading food industry sector and the majority are women or housewives.

The average income of people employed in the leading food industry is IDR 1.5 million for a single production period of 1.5 months for the leading food industry. This is equal to monthly community income of IDR 1 million. This figure is still far from the provincial minimum wage that has reached IDR 2.4 million. The results of this research show the significant impact of the production of the leading small and medium-sized food industry on the income of the surrounding community as industrial workers.

The results of the research above indicate that it is in line with the results of research by Hidayat (2005) which states that industrial development through the export agro-industrial commodity approach has an impact on income. The findings of this study also show that the development of the leading small and medium-sized food industry has an impact on the income of the surrounding community as industrial workers.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

Determinants of the leading small and medium-sized industrial (SMI) production are investment, production capacity, labor, sales and use of technology. However, individually, sales factors greatly influence the production of the leading food industries with promotion and market share as the two main keys.

The leading food industry production has a very significant influence on community income with a share of 59.54%. The amount of income earned by the people employed in the leading small and medium-sized food industry (SMI) is IDR 1.5 million for a single production period of 1.5 months or approximately IDR 1 million per month.

Recommendations

Developing a center for the promotion of leading food SMIs products through online and offline. To go online, a multimedia center promotion needs to be encouraged and planned to proceed so that online shopping services can be offered to the leading food SMI entrepreneurs. As for offline promotion, partnership with malls and supermarkets/minimarkets is required for the leading retailers of leading food SMI products with minimal costs.

Building a technology design center for products and leading modern high school food products that allowing them to produce up-to-date and high-quality products with low cost of production so that the selling price can be competitive.

REFERENCES

Baidya, M.K & Ghose, K. (2010). Effectiveness of sales promotion effort in emerging markets: a brand level analysis. *International Journal of Business and Emerging Markets*, 2(1), pages 43-57.

Darmadi, D., Suharyono, Latief, W.A. (2013). Pengaruh Promosi Penjualan terhadap Penjualan (Kasus PT. Astra Internasional Tbk-TSO Cabang Soetoyo Malang). *Jurnal Administrasi Bisnis*, 2(1), 21-28

Fauzi, A., Amir, A., Junaidi, J. & Hidayat, S. (2019). Change of Economic Structure in Jambi Province: Input-Output Model Approach. *Scientific Research Journal*, 7(8), 62 - 72

Guine, R.P.F., Ramalhosa, E.C.D., & Valente, L.P. (2016). New Foods, New Consumers: Innovation in Food Product Development. *Current Nutrition and Food Science*. 12(3), 175-189

Hidayat, M.S. (2005). *Analisis Pengembangan Industri Melalui Pendekatan Komoditas Agroindustri Ekspor dan Pengaruhnya terhadap Penggunaan Tenaga Kerja dan Pendapatan di Provonsi Jambi*. (Unpublished doctoral dissertation). Universitas Padjadjaran, Bandung

Hidayat, M.S & Rasjid, M.R (2019). Policy Analysis On Development Of Leading Creative Industry Products In Muara Bungo Regency. *International Journal Of Scientific & Technology Research*, 8(11), 1941-1944

Jasmani (2018). Pengaruh Promosi dan Pengembangan Produk terhadap Peningkatan Hasil Penjualan. *Jurnal Semarak*, 1(3), 142-157

Jayanti, P.T & Musqorobin, M. (2017). Analisis Strategi dan Program Peningkatan Daya Saing Pada Industri Unggulan Provinsi Jawa Tengah Dalam Menghadapi Masyarakat Ekonomi ASEAN (MEA). *Jurnal Ekonomi dan Studi Pembangunan*, 18(1), 52-61

Ketema, M. & Kassa, B. (2016). Impact of Technology on Smallhoder Wheat Prodution in Bale Highlands of Ethiopia: Application of Outpur Decomposition Model. *Turkish Journal of Agriculture – Food Science and Technology*, 4(6), 446-454

Meirejeki, I, N. (2016). Pemilihan Industri Unggulan Sebagai Dasar Pengembangan Industri Kerajinan di Kabupaten Jembrana. *Jurnal Bisnis dan Kewirausahaan*, 12(1), 74-82.

Prakash, S. & Sharma, R. (2011). *Impact of Technology on Production in Indian Economy*. International Conference on Education, Research and Innovation, 18, 77-83

Saguy, I.S. & Sirotinskaya V. (2014). Challenges in exploiting open innovation's full potential in the food industry with a focus on small and medium enterprises (SMEs). *Trends Food Science & Technology*, 38(2), 136-148

Sobari, E. (2018). *Teknologi Pengolahan Pangan*: *Prinsip dan Praktik*. Yogyakarta: Penerbit Andi

Wibowo, S.A. & Nugroho, S.B.M. (2018). Analisis Faktor-faktor yang mempengaruhi produksi Industri Pengolahan dan Efisiensi Produksi pada Kabupaten/Kota di Jawa Tengah tahun 2010-2015. *Jurnal Media Ekonomi dan Manajemen*, 33(2), 205-213.

Yuvanda, S. & Rosita, R. (2018). Analisis Produk Perkebunan Rakyat Unggulan Dan Dampaknya Terhadap Daya Serap Tenaga Kerja Untuk Pengentasan Kemiskinan Di Kabupaten Batanghari. *Jurnal Development*, 6(2), 105-115.

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