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Impact of Trade Liberalization on Economic Growth in Japan: Autoregressive Distributed Lag Model (ARDL)

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Abstract
The objective of this study is to identify the impact of trade liberalization on economic growth in Japan. Annual data are utilized from 1985 to 2016 via on Autoregressive Distributed Lag Model (ARDL) Cointegration test and Vector Error Correction Model (VECM) based Granger causality. The findings from unit root tests revealed that all the variables of mixed results whereby they are integrated at I(0) and I(1) and could proceed to the ARDL Cointegration test. Furthermore, all the variables have long-run relationships between trade openness, investment, education, inflation and economic growth in Japan. However, this study found a significant positive of trade openness and investment on economic growth in the long run. Lastly, VECM based Granger causality showed some of the causality relationships between variables in the short run for Japan.
Keywords: ARDL, Economic growth, Trade liberalization.

Introduction
Trade liberalization is the process of removing barriers and opening the economy of one country to abroad investment and competition. According to Narayan and Smyth (2005), trade liberalization can refer to three aspects, namely diminution in a barrier of imports with unchanged in the incentive of exports; the composition in relative prices towards neutrality; and the substitution of cheaper for expensive forms of protection. The history of 70 years in Japan, it's economic had built by a strong work ethic, mastery of high technology, a comparatively small defense allocation, and cooperation with government-industry (Central Intelligence Agency's World Factbook [CIA], 2018). The fourth biggest industrialized and free-market economy in the world is Japan. The main economy of Japan as well-known by its competitiveness and efficiency in exports oriented sectors, but the productivity of services,

agriculture, and distribution are lower compare to other sectors. Japan had the second-highest gross domestic product (GDP) in the world during the 1970s but in the beginning of 1990s Japan has succumbed to the economic recession of 10 years, also called "*Lost Decade*". This is because Japan was a speculative asset price bubble during a boom cycle that sent valuations soaring throughout the 1980s (Kuepper, 2018). During the year 2011 to 2016, Japan's exports have decreased at an annualized rate of -4.4%, from JYP 65,546.48 billion in 2011 to JYP 70,035.77 billion in 2016. Besides that, Japan's imports totaled JYP 66,041.97 billion in 2016, decreasing -15.77% compared with the previous year. It effects the economic growth of Japan growing in a moderate rate. However, based on the export-led growth theory, Japan's economic growth should grow at an accelerated rate. Therefore, the economy of Japan may yet recover from the Lost Decade economic crisis. However, academic are sceptic whether the trade liberalization brings more positive or negative impacts to the economic growth. According to Drozdz and Miskinis (2011), a positive effect between free trade toward economic growth may make a good intention for producers to expand their business to larger markets and help developing countries access the capital goods and as an intermediate in the process of development. If the import item of the country is an important raw material in the production, thus the country will become more dependent on other countries' supplies and markets (United Nations Development Programme [UNDP], 2018).

Trade liberalization may bring a negative impact on the developing countries due to the unstable economy, thus it will increase the pressure to liberalize trade. For example, as stated by Freckleton (2007), trade liberalization had a negative effect on the economic growth of Jamaica due to trade liberalization effected the depreciation of price incentives, it shows that trade liberalization not necessary can reduce the bias against imports and exports but insufficient to solve the structural constraints such as weak industrial sectors, dependence on primary commodity exports, underdeveloped human resource, deficient technology, and inadequate infrastructure. Therefore, it shows that trade liberalization is unlikely to positively impact growth; it may also negatively impact the economic growth of developing countries. The aim of this study is to identify the impact of trade liberalization on economic growth in Japan by determining the relationship between trade openness, investment, human capital accumulation, inflation, and economic growth in Japan and examine the pre and post of trade liberalization on the economic growth of Japan

Literature Review

The literature study concluded that the trade openness can have a positive effect or negative effect on GDP growth. Most of the researchers argued that trade liberalization has a positive effect on economic growth. However, some of the researchers showed a negative effect of trade openness on economic growth in the long run.

Onafowora and Owoye (1998) found a positive relationship between trade policies and economic growth by used the VECM test for the period from the year 1963 to 1993 in 12 sub-Saharan African (SSA) countries. They also stated that the importance of export expansion and an outward-oriented trade policy in enhancing economic growth. After the initial phase of trade liberalization, the imports of 42 developing countries are increased following by the exports, and the overall the balance of trade is deficits (Parikh, 2004). The author also postulated that in the short to medium-run, trade liberalization enhances GDP growth, which means there is a significant relationship between trade openness and economic growth.

Matadeen et al (2011) hypothesized that the impact of trade openness on economic growth in the long run is the openness stimulates growth. In the short run, the results of the VECM based Granger causality test depicted the existence of bi-directional causality between the trade liberalization proxy and economic growth. Thus, trade liberalization proved as an important ingredient for growth in Mauritius. On the other hand, Trejos and Barboza (2014) used dynamic error correction model (ECM) found that one of the major determinants of the growth rate of output per worker was trade liberalization arises during the post-crisis period, while in the pre-crisis period, trade liberalization no as the main determinant. They also suggested that the basis of large-scale capital accumulation and mobilization of labor will enhance economic growth.

Another research found that the real exports is significantly positive impact on economic growth, but the trade openness warps the economic growth of selected developing and least developed countries. The negative effect of trade openness index shows the existence of trade deficits (Shujaat, 2014). The impact of international trade on economic growth in Tanzania between 1970 to 2010 is positive and significant. Thus, it was expected that increase the removal of barriers will increase the balance of payment as well as promotes economic growth (Hamad, Burhan & Stabua, 2014). According to Pratibha and Preeti (2015), the relationship among the international trade and economic growth in China from 1980 to 2013 are cointegrated and bi-direction causality. For the result of VECM is statistically significant, negative and less than one which indicates that in the long run relationship between trade openness and growth not existing any problem. Therefore, increasing the foreign trade has made positive contribution in the GDP. The impact of trade openness toward economic growth on 12 selected MENA countries is positive due to the balance of payment is surplus (Hozouri, 2016). The author also found that the movement of economic growth had significant and negative correlated with the changing of tariff, and hence its relationship with the volume of trade is positive. Another previous study hypothesized that the link between trade openness and the economic growth of 87 selected OECD and developing countries stated that greater growth and higher economic performance will cause the higher trade openness in those countries. Trade openness had a significantly positive coefficient, which proved that it is a good incentive for growth postulated by studies such as Zarra-Nezhad, Hosseinpour and Arman (2014), Jamilah, Zulkornain and Muzafar (2016), Keho (2017), Idris, Yusop, Habibullah and Chin (2018).

Methodology

In this study, the main estimation technique is the time series approach because of this study is analyzing the movement of those variables of interest over the time period. The time period used in this study is annual which from year 1985 to 2016, which is total of 32 observations and the dependent variable is GDP growth, whereas the independent variables are trade openness, investment, human capital accumulation and inflation.

Table 1
Features of Variables

Variables	Proxy	Symbol	Data sources
GDP growth	GDP growth per capita	GDP	CEIC Database
Trade openness	Trade ratio of GDP	TO	CEIC Database
Investment	Real gross fixed capital formation	INV	The World Bank
Human capital accumulation	Secondary school enrollment rate	HC	E-stat of Japan Government
Inflation	Inflation rate	INF	The World Bank

This study employs the core model to investigate the effect of trade liberalization is based on the augmented aggregate production function. The following models are employed:

$$Y = f(TO, INV, HC, INF, DUM) \quad (1)$$

where, Y is gross domestic product (GDP) growth and in the function of TO, INV, HC, INF and DUM, which represent trade openness, investment, human capital accumulation, inflation and dummy variables indicating 2 time gap of trade liberalization in Japan, (1) the period before Japan sign the Free Trade Agreement between Japan and the Gulf Cooperation Council (GCC) (JGFTA) which is the time period from year 1985 to 2006 represent as trade liberalization era (DTL); and (2) the period after Japan signed JGFTA with GCC which is the time period from year 2007 to 2016 represent as post-trade liberalization era respectively.

From the core model can be written into an econometric model:

$$LGDP_t = \beta_0 + \beta_1 LTO_t + \beta_2 LINV_t + \beta_3 LHC_t + \beta_4 LINF_t + \beta_5 DUM_t + \varepsilon_t \quad (2)$$

where $LGDP_t$, LTO_t, $LINV_t$, LHC_t, and $LINF_t$ are the logarithm of GDP growth per capita, trade ratio on GDP, gross fixed capital formation, secondary school enrollment and inflation rate, respectively; DUM_t is dummy variable indicating the value of zero (0) for periods before trade liberalization era and one (1) periods after the trade liberalization; β_0 is constant term; β_1, β_2, β_3 β_4 and β_5 are coefficient to measure the impact of trade openness, investment, human capital accumulation, inflation and the dummy variable on the GDP growth respectively; t is time period (1,…, T); and ε_t is the stochastic error term.

This study will use the Autoregressive Distributed Lags (ARDL) to cointegrate to determine the short-run and long-run relationship between trade liberalization and economic growth in Japan. Thus, it will conduct the three types of test which are Unit Root test, ARDL Cointegration test and Vector Error Correction Model (VECM) based Granger Causality test to identify the relationship between the trade liberalization and economic growth and the interrelationship between the explanatory variables. First, determine the stationarity of time series variables by unit root tests. The spurious regression exists when those time series variables are non-stationary (Mahadeva & Robinson, 2004). Therefore, the unit root test is the pre-condition of cointegration test. In this study, three types of root tests will be used which are Augmented Dickey-Fuller(ADF) and Kwiatkowski, Philips, Schmidt and Shin (KPSS), those tests will determine the order of integration of among each variable. According to Nkoro and Uko (2016), the null hypothesis of the ADF test is that the time series variable has a unit root that means the time series variable is not stationary, while the null hypothesis of the KPSS test is the time series variable is stationary. After that, proceed to test cointegration test that indicates the existence of a long-run equilibrium relationship between trade openness, investment, human capital accumulation, inflation, dummy variable and economic growth within a multivariate framework. As stated in the introduction of the chapter, to test for the existence of any long-run relation among the variables, conduct the ARDL bounds testing procedure. This involves investigating the existence of a long-run relationship using the following ARDL framework:

$$\begin{aligned}\Delta LGDP_t = \delta_0 &+ \sum_{i=1}^{p} \varepsilon_i \Delta LGDP_{t-i} + \sum_{i=1}^{p} \beta_i \Delta LTO_{t-i} + \sum_{i=1}^{p} \delta_i \Delta LINV_{t-i} + \sum_{i=1}^{p} \psi_i \Delta LHC_{t-i} \\ &+ \sum_{i=1}^{p} \varsigma_i \Delta LINF_{t-i} + \sum_{i=1}^{p} \varphi_i \Delta DUM_{t-i} + \lambda_1 LGDP_{t-1} + \lambda_2 LTO_{t-1} + \lambda_3 LINV_{t-1} \\ &+ \lambda_4 LHC_{t-1} + \lambda_5 LINF_{t-1} + \lambda_6 DUM_{t-1} + \lambda_7 D_{LGDPt} + u_t \end{aligned} \quad (3)$$

where Δ is the lag operator and u_t is the error term. The ARDL cointegration test is used the overall of F-test statistic and t-statistic to test on the regression. The null hypothesis of *F*-statistic for equation (3.15) as follows:

$$H_0 : \lambda_1 = \lambda_2 = \lambda_3 = \lambda_4 = \lambda_5 = \lambda_6 = \lambda_7 \text{ (no cointegration)}$$
$$H_a : \lambda_1 \neq \lambda_2 \neq \lambda_3 \neq \lambda_4 \neq \lambda_5 \neq \lambda_6 \neq \lambda_7 \text{ (exist contegration)}$$

The way determines the decision rule of long-run relationship: when the *F*-test statistic is greater than the critical value, then the H_0 can be rejected so exist the long-run relationship; and when the *F*-test statistic is less than the critical value, then the H_0 cannot be rejected so do not exist the long-run relationship. Besides that, the *t*-statistic is tested through $\lambda_1 = 0$ in Eq. (3). After the existing the long-run relationship and proceed to estimate the long run and short coefficients. The ARDL approach estimates $(p+1)^k$ by obtain the number of optimal lags for each variable on regressions, where *p* is the maximum number of used lags and *k* is the number of variables in the regression. Based on the exception of a study by Narayan and Smyth (2004), since their used annual data in this study, and the maximum number of lags their used in the ARDL model was set equal to two. To ensure the goodness of fit of the ARDL approach, the diagnostic tests are conducted.

This study used the Granger Causality test to keep the variables constant to determine the direction of the relations among those variables. To avoid the issue of misspecification, this study use the technique of Vector Error Correction Model (VECM) Granger Causality test, this approach is used when there is a set of variables found to have one or more cointegrating vectors the equation (Granger, 1988). One advantage by using VECM based Granger Causality test is that it can distinguish both the long run and short-run causal relationship that consist of those variables in the equation. The significance of F-statistic shows the short-run causality while the error correction term, ECt-1 indicates the long-run effects. Below indicates the equations of VECM based Granger Causality Test:

$$\begin{bmatrix} \Delta LGDP_t \\ \Delta LTO_t \\ \Delta LINV_t \\ \Delta LHC_t \\ \Delta LINF_t \\ \Delta DUM_t \end{bmatrix} = \begin{bmatrix} \beta_1 \\ \beta_2 \\ \beta_3 \\ \beta_4 \\ \beta_5 \\ \beta_6 \end{bmatrix} + \sum_{i=1}^{\rho} \begin{bmatrix} n_{11i} & n_{12i} & n_{13i} \\ n_{21i} & n_{22i} & n_{23i} \\ n_{31i} & n_{32i} & n_{33i} \\ n_{41i} & n_{42i} & n_{43i} \\ n_{51i} & n_{52i} & n_{53i} \\ n_{61i} & n_{62i} & n_{63i} \end{bmatrix} \begin{bmatrix} \Delta InLGDP_{t-i} \\ \Delta InLTO_{t-i} \\ \Delta InLINV_{t-i} \\ \Delta InLHC_{t-i} \\ \Delta InLINF_{t-i} \\ \Delta InDUM_{t-i} \end{bmatrix} + \begin{bmatrix} \lambda_1 \\ \lambda_2 \\ \lambda_3 \\ \lambda_4 \\ \lambda_5 \\ \lambda_6 \end{bmatrix} [EC_{t-1}] + \begin{bmatrix} \varpi_1 \\ \varpi_2 \\ \varpi_3 \\ \varpi_4 \\ \varpi_5 \\ \varpi_6 \end{bmatrix} \quad (4)$$

where Δ is the lag operator; ς and λ is the coefficient to be estimated; ϖ_t is serially independent random errors with mean zero and finite covariance matrix; $LGDP_t$ the value of logarithm GDP growth per capita in tth year; LTO_t is the value of logarithm trade ratio of GDP in tth year; $LINV_t$ is the value of logarithm gross fixed capital formation in tth year; LHC_t the value of logarithm secondary school enrollment rate in tth year; $LINF_t$ the value of logarithm inflation rate in tth year; DUM_t is the dummy variables of before and after trade in tth year; and EC_{t-1} is the error correction term. In every case of the dependent variable is returned against previous values of itself and other variables. The number of lag length (p) is determine based on the Schwarz Bayesian Criterion. The existence of a cointegrating relationship among [$LGDP_t$, LTO_t, $LINV_t$, LHC_t, $LINF_t$, DUM_t] suggests that there must be at least one direction of Granger causality, but it does not show the direction of temporal causality between the variables.

Findings

This chapter will discuss and interpreting the findings of Eview analysis. The following sections will present the Unit Root Tests which include Augmented Dickey-Fuller (ADF) test and Kwiatkowski-Phillips- Schmidt-Shin (KPSS).

Table 2
Unit Root Tests Results

	ADF		KPSS	
	Intercept	**Trend & Intercept**	**Intercept**	**Trend & Intercept**
A: Level				
LGDP	-4.877(0)***	-5.205(0)***	0.422(0)*	0.148(8)**
LTO	-0.988(0)	-2.560(1)	0.604(4)**	0.160(3)**
LINV	-0.963(2)	-2.527(2)	0.559(5)**	0.259(0)***
LEDU	-1.991(1)	-2.461(1)	0.712(4)**	0.158(4)**
LINF	-2.416(0)	-2.403(0)	0.567(1)**	0.190(1)**
DUM	-0.633(0)	-1.963(0)	0.562(4)**	0.151(4)**
B: First Difference				
LGDP	-8.810(0)***	-8.664(0)***	0.175(0)**	0.467(28)**
LTO	-5.520(0)***	-5.239(0)***	0.229(3)	0.136(2)*
LINV	-3.404(2)**	-3.514(3)*	0.155(1)	0.131(2)*
LEDU	-3.200(8)**	-2.980(0)	0.285(3)	0.083(2)
LINF	-5.826(0)***	-5.810(0)***	0.166(5)	0.077(4)
DUM	-5.477(0)***	-5.458(0)***	0.134(2)	0.073(3)

Notes: * denotes 10% significance level, ** denotes 5% significance level, *** denotes 1% significance level. The number in parentheses ( ) is the number of lags. Lag lengths for the ADF unit root test are based on the Schwarz's Information Criterion, while lag lengths for the KPSS test is based on the Newey-West Bandwidth which estimate using the Barlett Kernel. LGDP, LTO, LINV, LEDU, LINF, and DUM refer as the logarithm of GDP growth per capita, trade ratio of GDP, real gross fixed capital formation, secondary school enrollment rate, inflation rate, and dummy variable, respectively

The empirical result of ADF test in Table 2 portrayed mix result at level as well as at first difference, while all of the variables are statistically significant at 5% significant level. However, the result of KPSS test showed that all the six variables are able to reject the null hypothesis at level, since KPSS test has an inverse hypothesis compare to ADF test. Therefore, it shows that all six variables are integrated at *I*(0) and *I*(1). Overall, the test proved there is exist of integration among all six variables in Japan. After unit root tests, it proceeds into the ARDL Cointegration test to determine the long-run relationship between the dependent and independent variables. Since the calculated *F*-statistics are larger than upper bound of critical bounds values at 1% of significant level, thus it indicated that all variables are cointegrated. The results of ARDL in long run stated that some of the variables such as trade openness and investment are exhibit a positive impact on economic growth in Japan while both variables are statistically significant at 1% significance level. Meanwhile, the dummy variable is statistically significant negative effect on economic growth in the long run. On the other side, education and inflation are insignificant positive and negative impacts respectively on economic growth in long run. The result of Table 3 reports the calculated *F*-statistic is 4.3548, which greater than the critical values for both of the lower and upper bound at 2.5% of the significance level. This shows that all the variable which LGDP, LTO, LINV, LEDU, LINF, and DUM are cointegrated. In this study, Akaike Info Criterion (AIC) is used to determining optimal lag length for the model. Therefore, the optimal lag length selected based on AIC of the ARDL model is (3, 0, 0, 0, 0, 0).

Table 3
Bounds test F-test for Cointegration

Dependent Variable	Function	*F*-statistic	Cointegration Status
LGDP	F(LGDP| LTO, LINV, LEDU, LINF, DUM)	4.3548***	Cointegrated

Note: *** denote significance level at 2.5%.

Table 4
Critical Values of Autoregressive Distributed Lag (ARDL) Bounds Test

Level of significance (%)	Lower bound	Upper bound
10%	2.26	3.35
5%	2.62	3.79
2.5%	2.96	4.18
1%	3.41	4.68

Table 5
Long-run Autoregressive Distributed Lag (ARDL) Model

Regressor	Coefficient	Std. Error	*t*-Statistic	Probability
LTO	1.4309***	0.3792	3.7737	0.0012
LINV	3.1880**	1.5185	2.0994	0.0487
LEDU	2.6180	9.4901	0.2759	0.7855
LINF	-0.0269	0.1279	-0.2103	0.8355
DUM	-0.3480**	0.1480	-2.3508	0.0291
C	-24.6825	47.7345	-0.5171	0.6108

Note: *, ** and *** denotes significance level at 10%, 5%, and 1%, respectively.
Dependent variable is LGDP.

Table 5 states about the long-run ARDL model results in this study. The long-run regression results report that LTO and LINV are statistically significant positive impact on LGDP while DUM is significant negative impact on LGDP in Japan. On the others side, the LINF and LEDU are not significant with respectively negative and positive impact on economic growth of Japan in the long run. The result of trade openness showed significant positive effect to economic growth, in the long run, is constant with the finding of Nana and Barnes (2016). The result also indicates that an increase in trade openness might lead to a rise in exports, thus increasing economic growth in the long run. For the long run result of gross fixed capital formation, there is a statistically significant positive effect on GDP growth supported by Yavari and Mohseni (2012). Hence, the larger investment will boost the aggregate demand and economic growth in long run. Meanwhile, the result of LEDU positively impacts LGDP, but not significant in the long run relationship. The estimated result supported by Narayan and Smyth (2010) which employed research by utilized quarterly time series data from 1962 to 2000 in Fiji whereby education have greatest positive effect on GDP in long run relationship. The finding of an insignificant negative relationship between LINF and LGDP had been proved by Mireku, Agyei and Domeher (2017) in Ghana. This shows that when consumer price index (CPI) increase will effect consumption decrease, economic growth will decrease in the long run. The education and inflation indicated insignificant result towards the economic growth of Japan in long run. Therefore, it shows that education and inflation do not have effect on economic growth in the long run. In addition, the result of dummy variable, in the long run, is statistically significant negative effect on the economic growth of Japan. This indicates that the JGFTA has a negative impact on economic growth in the long run, while it may due to the post period of JGFTA too short in this study, and it may have a positive impact on economic growth in the future.

Table 6
Short-run Autoregressive Distributed Lag (ARDL) Model

Regressor	Coefficient	Std. Error	*t*-Statistic	Probability
D(LGDP(-1))	0.6860*	0.3536	1.9399	0.0666
D(LGDP(-2))	0.3055*	0.1726	1.7706	0.0919
D(LTO)	3.1554***	0.7725	4.0847	0.0006
D(LINV)	7.0301***	2.4654	2.8515	0.0099
D(LEDU)	5.7732	20.3582	0.2836	0.7796
D(LINF)	-0.0593	0.2692	-0.2204	0.8278
D(DUM)	-0.7673*	0.4198	-1.8280	0.0825
ECM(-1)	-2.2052***	0.6092	-3.6197	0.0017

Note: *, ** and *** denotes 10%, 5% and 1% significant levels, respectively. D denotes first difference operator. Dependent variable is LGDP.

Based on Table 6, the short-run ARDL regression results indicate that 3 of the variables are statistically significant at different significance level which LTO, LINV and DUM are statistically significant at 1%, and 10% of the significance level, respectively. The coefficient of ECM in table 4.3.3 is -2.2052, which it consists a negative sign and statistically significant at 1% of the significance level. Therefore, it is preferable and consistent in the short run regression. The coefficient of ECM also indicates that the adjustment speed for the variables to reach the long-run equilibrium is about 220.52% annually. In conclusion, the calculated R-squared of the selected ARDL approach is approximately 98.15%, which means the ADRL model is fits well and about 98.15% variation of LGDP can be explained by LTO, LINV, LEDU, LINF and DUM.

Table 7
Vector Error Correction Model (VECM) based Granger Causality

	Chi-square Value					
	ΔLGDP	ΔLTO	ΔLINV	ΔLEDU	ΔLINF	ΔDUM
ΔLGDP	-	3.9689** (0.0463)	6.9708*** (0.0083)	0.7127 (0.3985)	1.2839 (0.2572)	3.6547* (0.0559)
ΔLTO	25.5058*** (0.0000)	-	27.0985*** (0.0000)	2.4983 (0.1140)	4.9601** (0.0259)	17.5744*** (0.0000)
ΔLINV	21.3295*** (0.0000)	6.2080** (0.0127)	-	0.3297 (0.5658)	4.0461** (0.0443)	4.1529** (0.0416)
ΔLEDU	0.5412 (0.4620)	2.4599 (0.1168)	2.5632 (0.1094)	-	0.3929 (0.5308)	0.3680 (0.5441)
ΔLINF	2.3683 (0.1238)	10.3197*** (0.0013)	4.6485** (0.0311)	1.7155 (0.1903)	-	0.2966 (0.5860)
ΔDUM	0.4897 (0.4840)	2.0894 (0.1483)	0.0335 (0.8548)	0.0872 (0.7678)	0.1697 (0.6804)	-

Note: *, ** and *** denotes the rejection of null hypothesis at 10%, 5% and 1% significance levels, respectively while the number in ( ) represents the *p*-value.

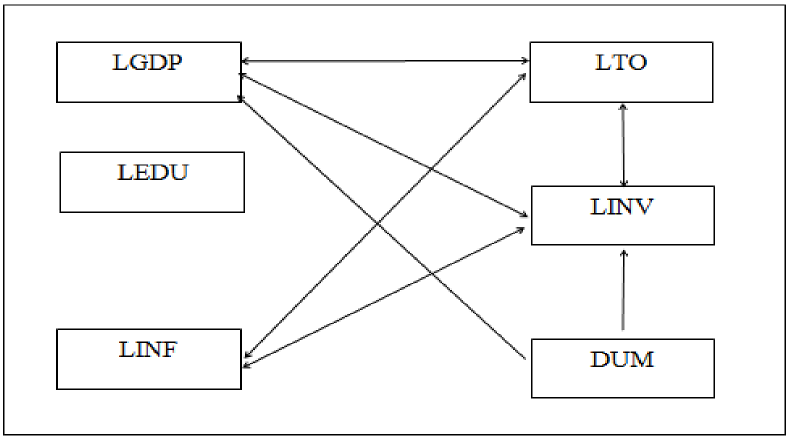

Figure 1. Summary of Short-Run Causality Linkages

Table 7 shows that this study existing five bidirectional Granger causality and three uni-directional Granger causality in short-run by used the VECM based Granger causality. The results indicate the existence of a bidirectional relationship between LTO and LGDP in the short run which both of the probability are less than 0.05 and rejected H_0. Next, LINV does granger cause LGDP and LGDP does granger cause LINV in the short run. Besides, two bi-directional Granger causality which LINV to LTO and from LTO to LINV while from LTO to LINF and from LINF to LTO in this study. On the other word, the rejections of the 5% of significant level occur between LTO, LINF and LINV. In addition, the LINV does granger cause LINF and the LINF does granger cause LINV with bidirectional which caused by the probabilities are less than 5% of significance level. Moreover, the results of DUM does granger cause LGDP, which the probability (0.0559) is less than 0.10 and rejected H_0. For the relationship between DUM and LTO is a unidirectional Granger causality that indicated by the rejection of H0 where the probability is less than 0.01 and the DUM dose granger cause LTO. Furthermore, the probability value (0.0416) of direction from DUM to LINV is lower than 5%, thus rejected H0 whereby the DUM dose granger causes LINV. Lastly, there is no causality of education with other variables. The result of VECM based Granger Causality exhibited the existence of five bidirectional Granger causality and three uni-directional Granger causality in this study. One of the bidirectional Granger causality from LTO to LGDP is constant with the finding of Pratibha and Preeti (2015). The existence of another four bidirectional Granger causality are running from LINV to LGDP, from LINF to LTO, from LINV to LTO, and LINV to LINF where the probability are lower than 5% significance level and rejected null hypothesis. Besides that, the three uni-directional Granger causality all running from DUM to LGDP, LTO, and LINV respectively. In addition, the VECM Granger Causality results also found there is no causality of education to other variables.

Table 8
Diagnostic Tests Result

Diagnostic tests	Probability	Significant	Conclusion
Jarque-Bera	0.1566	Statistically insignificant	Normal Distribution
Breusch-Godfrey Serial Correlation LM Test	0.2538	Statistically insignificant	No Serial Correlation problem
Heteroscedaticity Tests (ARCH)	0.8955	Statistically insignificant	Homoscedasticity
Ramsey RESET Test	0.4946	Statistically insignificant	Model correctly specified

Diagnostic tests are conducted to ensure the model does not have abnormal distribution, serial correlation, heteroscedasticity, and functional misspecification. Therefore, the results of diagnostic checking indicated that this model considered as the Best Linear Unbiased Estimator (BLUE) as there are no autocorrelation, heteroscedasticity and multicollinearity in the model at 5% significance level. Furthermore, the model is correctly specified and the error terms are normally distributed.The results on Table 8 show that all the probabilities of diagnostic tests are greater than 0.05 and do not reject the null hypothesis, which mean the model does not have the problems of serial correlation, heteroscedasticity, functional misspecification while the model is normally distributed. The cumulative sum of recursive residual (CUSUM) and cumulative sum of squares of recursive residual (CUSUMQ) of the model do not exceed the critical limits at 5% significance level. Thus, it appeared to be stable in this study.

Conclusion

This study aims to examine the effects of trade liberalization on economic growth in Japan. The relationship between trade openness, investment, human capital accumulation, inflation and economic growth is examined using the Autoregressive Distributed lag (ARDL) approach. Prior to the estimation, unit root tests, namely the Augmented Dickey-Fuller test, Phillips-Perron test and Kwiatkowsi-Phillips-Schmidt-Shin test were conducted to test on the stationarity of each variable. Stationarity test results indicate that all variables are integrated at *I*(1). ARDL result indicates that trade has a positive relationship with economic growth in Japan.

In term of the policy perspective, the results indicated that trade openness do Granger cause the economic growth. Meanwhile, this study proved that the positive long-run relationship between trade openness and investment on the economic growth in Japan. The result existed a positive impact of trade liberalization and foreign direct investment on economic growth since short run regression. Besides, the result of pre and post trade agreement between Japan and the Gulf Cooperation Council is stated that a negative effect on economic growth in both of the periods. These results could be used as a guideline to the trade participants likes governments, investors, policymakers, exporter and others in order to enhance the economic growth in Japan. In conclusion, this study has stated that there is a relationship between trade openness, capital stock, human capital accumulation, inflation and economic growth. On the other side, the relationship between the economic growth and those independent variables might be different due to the different data used as proxy of certain variables. Therefore, some limitations that may falsify the finding's accuracy in this study are only focused on one selected country, and lack of information arises from insufficient studies specifically related to the trade liberalization on economic growth in Japan. The future research can be done by utilizing the panel data to compare with other countries and add more important variables like labor force, exchange rates, and taxes on trade. Furthermore, the results and findings can give those trade participants more understanding about the importance of trade liberalization on economic growth as a way to encourage producers to increase the productivity by comparative advantage and increase the aggregate economic output in Japan. Based on the results in this study, Japan will still highly dependent on trade liberalization as the main engine on economic growth in the future.

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