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The Nexus between Export, Import, Domestic Investment and Economic Growth in Japan

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Abstract

This paper investigates the relationship between export, import, domestic investment and economic growth in Japan. In order to achieve this purpose, annual data for the period between 1970 and 2015 was tested by using Correlation analysis and regression analysis. The result of the Correlation analysis shows that all variables are positively correlated. According to the results of the regression analysis estimation, domestic investment and exports are significant in explaining the economic growth, namely an increase in domestic exports and investment leads to an increase in economic growth. On the other hand, import has no effect on gross domestic product. These results provide evidence that exports and domestic investment, thus, are seen as the source of economic growth in Japan.

Keywords: Domestic Investment, Export, Import, Economic Growth, Japan.

JEL Classification: C13, E22, F14.

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I. Introduction

Japan became starting from 2012's third-largest economy in terms of GDP after the United States and China, the state's fourth-largest economy in terms of purchasing power parity, after the United States, China and India. Since December 2013, the public debt has been the largest at 200 percent of annual GDP, making it the second country in the world in this respect. Japan has a huge industrial strength, which is home to more sophisticated machinery producers, such as cars and electronic machines operating, iron and nonferrous metals, ships, chemicals, food and artifacts. Take agriculture, forestry and fishing in Japan space of thirteen percent of the land, and Japan accounted for about fifteen of the global share of the fish, which puts it in second place after China. Japan's exports amounted to 4.2 US $ per capita in 2005, and starting in 2012 has become the main export markets are China (18.1 %) and the United States (17.8%) and South Korea (7.7 %) and Thailand (5.5 %) and Hong Kong (5.1 %), basic exports are transportation, automotive, electronics, electrical machinery and chemical equipment. The import markets in Japan starting in 2012 are: China (21.3 %) and the United States (8.8 %), Australia (6.4 %) and Saudi Arabia (6.2 %) and the United Arab Emirates (5 %) and South Korea (4.6 %) and Qatar (4 %). Japan's main imports are machinery and equipment and fossil fuels, foodstuffs, chemicals, textiles and raw materials. According to the procedures of market share, the domestic market in Japan is at least more than any other country in the Organization for Economic Co-operation and Development freedom. The general objective of this study is to investigate the relationship among domestic investment, export, import and economic growth in Japan. To achieve this objective, the paper is structured as follows. In section 2, we present the review literature concerning the nexus between domestic investment, export, import and economic growth. Secondly, we discuss the Methodology Model Specification and data used in this study in Section 3. Thirdly, Section 4 presents the empirical results as well as the analysis of the findings. Finally, Section 5 is dedicated to our conclusion.

II. Literature Survey

1) Export, import and economic growth

Since the review of literature has shown that import is the main variable in modeling export growth relationship, many studies examined the relationship among export, import and economic growth. These studies include:

Hadi Salehi Esfahani (1989) examined the relationship between trade and economic growth in 31 countries during the periods 1960 - 1973 by using OLS and Granger causality tests. The major contribution of exports to the GDP growth rate is to relieve the import shortage that many semi-industrialized country confront.

Iscan, Talan (1998) analyzed the effect of trade openness on total factor productivity growth for Mexican manufacturing industries for the period 1970 to 1990. The results of the GMM estimations showed that trade have positively affected on productivity growth.

Frederik Sjôholom (1999) investigated the nexus between exports, imports and economic growth in Indonesia during the period 1980 - 1991. OLS was employed in the empirical analysis. The results show that Exports have shown comparable high productivity growth. Also, this study proves that the larger the share of an establishment's output that is exported, the higher its productivity growth. And finally, the effects of imports on productivity growth are mixed.

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Francisco Ramos (2001) investigated the Granger-causality between exports, imports and economic growth in Portugal over the period 1865-1998. The empirical results of the study didn't confirm a unidirectional causality between the variables considered. There is a feedback effect between exports-output growth and import-output growth.

Bouoiyour, Jamal (2003) involved cointegration and Granger-causality tests to examine the relationship between trade and economic growth in Morocco over the period 1960-2000 using the VEC model. The empirical results of the study indicate that both exports and imports enter with positive signs in the cointegration equation. Also the results show that imports and exports Granger caused GDP and imports Granger caused exports.

Mamoon and Mursed (2006) used data of different countries which have differences in per capita income by employing instrumental technique; their study examined the importance of institutions, trade policies relevant to economic growth. However findings of their study showed that openness measures have insignificant impact on growth

Çetintaş and Barişik (2009) analyzed the relationships between export, import and economic growth for the 13 transition economies. The study used quarterly data of 13 transition economies from 1995 to 2006, by using Panel Unit Root Test Panel Cointegration Test and Panel Causality Test. The empirical results showed that there is a unidirectional causality from economic growth to export. Empirical findings showed that the growth-led export hypothesis is valid in those countries and growth is rather shaped by increase in import demand.

Dilawar Khan and al (2012) examined the nexus between exports, imports and economic growth in Pakistan by using annual data (1972-2009), and which is tested by employing Cointegration analysis, VECM and Granger causality tests. the results show in the first place that there is a long-run correlation among exports, imports, and economic growth. Second, they found that exports and imports are considered an essential part for economic growth of Pakistan. And finally, economic growth has an important impact on exports and imports.

Saaed and Hussain (2015) found unidirectional causality between exports and imports and between exports and economic growth in Tunisia for the period from 1977 to 2012. According to them growth in Tunisia was propelled by a growth -led import strategy. Imports are thus seen as the source of economic growth in Tunisia.

2) Domestic investment and economic growth

Other empirical studies investigated also the relationship between domestic investment and economic growth. These studies include:

Sumei Tang, E. A. Selvanathan and S. Selvanathan (2008) investigate the causal link between foreign direct investment (FDI), domestic investment and economic growth in China for the period 1988-2003. The results show that while there is a bi-directional causality between domestic investment and economic growth, there is only single-directional causality from FDI to domestic investment and to economic growth.

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Samuel Adams (2009) explores the impact of foreign direct investment and domestic investment on economic growth in Sub-Saharan Africa for the period 1990–2003. The results show that domestic investment is positive and significantly correlated with economic growth in both the OLS and fixed effects estimation.

Ghazali (2010) identified the causal relationship between private domestic investment and economic growth (GDP) in Pakistan over the period 1981 to 2008. He discovered that there is a bi-directional causality between private domestic investment and economic growth.

Adhikary (2011) found that, capital formation has long run relationship with export and import in Bangladesh. On the other hand, the study found long run causality relationship flows from trade, capital formation and FDI to economic growth. In this way the study concluded that, capital formation has long run relationship and cause economic growth.

Bakare (2011) studied the relationship between capital formation and growth rate with respect to Nigerian Economy using Harrod–Domar model. Using error correction mechanism, the study found out a positive long-run relationship between capital formation and economic growth in Nigeria

Tan and Tang (2011) investigated the dynamic relationship between private domestic investment (PDI), the user cost of capital and economic growth in Malaysia over the period of 1970 to 2009. His result shows that PDI, the user cost of capital, and economic growth are cointegrated in Malaysia. The Granger causality test shows that there is a unidirectional causality running from PDI to economic growth and from PDI to the user cost of capital in the long run.

Anis Omri and Bassem kahouli (2014) analyze the nexus among foreign investment, domestic capital and economic growth in 13 MENA countries by using a 'growth model' framework and simultaneous-equations models estimated by the Generalized Method of Moments (GMM) during the period 1990–2010. Empirical results show that there is bi-directional causal relationship between foreign investment and economic growth, between domestic capital and economic growth, and there is uni-directional causal relationship from foreign direct investment to domestic capital.

Njimanted G. Forgha, Mukete E. Mbella and Forbe H. Ngangnchi (2014) make a system estimation approach to analyze the nexus between external debt, domestic investment and economic growth in Cameroon for a period of 34 years (1980-2013), the results reveal that while domestic investment increases economic growth, external debt retards economic growth in Cameroon, revealing the influence of debt overhang.

Debi Prasad Bal, Devi Prasad Dash and Bibhudutta Subhasish (2016) examine the impact of capital formation on economic growth in India covering the period from 1970 to 2012.The error correction (ECM) model shows that the capital formation positively affects the economic growth in the short run. It is recommended that government increases the level of capital formation in order to achieve a higher level of economic growth.

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III. Data and Methodology

1. The Data:

The analysis used in this study cover annual time series of 1970 to 2015 or 46 observations which should be sufficient to capture the relation between Export, Import, Fixed Formation Capital and economic growth in Japan. The data set consists of observation for GDP, exports of goods and services (current US$), imports of goods and services (current US$) and Fixed Formation Capital (current US$). All data set are taken from World Development Indicators 2016.

2. Methodology

We will use the most appropriate method which consists firstly of determining the degree of integration of each variable. If the variables are all integrated in level, we apply an estimate based on a linear regression. On the other hand, if the variables are all integrated into the first difference, our estimates are based on an estimate of the VAR model. When the variables are integrated in the first difference we will examine and determine the cointegration between the variables, if the cointegration test indicates the absence of cointegration relation, we will use the model VAR. If the cointegration test indicates the presence of a cointegration relation between the different variables studied, the model VECM will be used.

3. Model specification:

The augmented production function including domestic investment, exports and imports is expressed as:

$$\mathbf{GDP_t = f(exports, imports, capital)} \quad \textbf{(1)}$$

The function can also be represented in a log-linear econometric format thus:

$$\mathbf{\log(GDP)_t = \beta_0 + \beta_1 \log(exports)_t + \beta_2 \log(imports)_t + \beta_3 \log(capital)_t + \varepsilon_t} \quad \textbf{(2)}$$

Where:

- β_0 : The constant term.
- β_1: coefficient of variable (exports)
- β_2: coefficient of variables (imports)
- β_3: coefficient of variable (capital)
- t: The time trend.
- ε: The random error term assumed to be normally, identically and independently distributed.

IV. Empirical analysis:

1) Unit root test results

Table 1: Test for unit root in level

Variable	Test critical values	test statistic	probability
Log (GDP)	2.929734	3.418180	0.0155
Log (Domestic Investment	2.929734	3.257115	0.0232
Log (exports)	3.584743	4.498369	0.0007
Log (imports)	3.584743	4.498369	0.0007

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2) Estimation OLS

Table 2: Linear regression estimation				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.480710	0.358389	-1.341308	0.1870
Log (Domestic Investment)	0.657601	0.041210	15.95741	0.0000
Log (Exports)	0.519407	0.086951	5.973542	0.0000
Log (Imports)	-0.097915	0.063948	-1.531160	0.1332

- **Estimation equation**

$$\mathbf{Log(GDP) = C(1) + C(2) * Log(Domestic\ Investment) + C(3) * Log(Exports) + C(4) * Log(imports)}$$

- **Substituted coefficient**

$$\mathbf{Log(GDP) = -0.4807 + 0.6576 * Log(Domestic\ Investment) + 0.5194 * Log(Exports) - 0.0979 * Log(imports)}$$

3) Diagnostic tests

Table 3: Residual Diagnostics Tests	
R-squared	0.997006
Adjusted R-squared	0.996792
F-statistic	4661.933
Prob(F-statistic)	0.000000
Jarque-Bera	0.154305
Probability	0.925749
Heteroskedasticity Test	0.3546
Anova F-test	0.0000
Welch F-test	0.0000

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4) Correlation:

Table 4: Correlation matrix

	Log (GDP)	Log (Exports)	Log (Imports)	Log (Domestic Investment)
Log (GDP)	1	0.98164569	0.94919350	0.99041091
Log (Exports)	0.98164569	1	0.98708076	0.95224545
Log(Imports)	0.94919350	0.98708076	1	0.90953779
Log (Domestic Investment)	0.99041091	0.95224545	0.90953779	1

We used the appropriate method in our empirical estimation which consists in studying in the first step the stationary of the variables included in our model. This stage is divided into two hypotheses: If the variables are all stationary in level, we will use a linear regression. If the variables are all stationary in first differences, an estimate based on the VAR model will be applied.

The stationary test results (ADF) show that all variables are stationary in level (Table 1), which obliges us to use an estimate based on a linear regression. The estimation of our model gives the following results; the domestic investment variable is significant to explain the gross domestic product since it has a probability of less than 5%. Otherwise, and concerning the analysis of this variable it is noted that a 1% increase in domestic investment leads to an increase of 0.657601% of the GDP. On the other hand, and for the export variable, we note that it is also significant to explain the GDP because it has a probability of less than 5%, so we notice that a 1% increase in exports leads to an increase of 0.519% of GDP. The variable that designates imports has not any effect on the dependent variable (GDP), since it has a probability greater than 5% (Table 2). Diagnostic tests (Table 3) are used in our empirical work to explain and supplement the quality of our estimation and our empirical results. These diagnostic tests contain R^2, Fisher Test, Jarque-Bera, Heteroskedasticity Test, Anova Test and Welch Test. To justify the quality and robustness of our estimate:

- R^2 must be greater than 60%
- The probability of the Fisher test must be less than 5%
- The probability of the Jarque -Bera test must be greater than 5%
- Heteroskedasticity Test must be greater than 5%
- Anova Test must be less than 5%
- Welch Test must be less than 5%

All tests are compatible to accept and to verify the quality of our estimate (our estimate is robust and well treated). Finally, the correlation matrix shows that all variables (GDP, exports, imports and domestic investment) are positively correlated (Table 4).

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V. Conclusion

The objective of this work is to study the impact of domestic investment, exports and imports for economic growth in Japan. To determine this goal, we have used a database that includes exports, imports, gross fixed capital formation (domestic investment) and gross domestic product (GDP) over the period 1970-2015. The empirical results show first that all variables are positively correlated. Otherwise, the estimation of our model is done by the use of a linear regression since all the variables are stationary in level. According to this estimate, domestic investment and exports are significant in explaining the dependent variables (GDP). On the other hand, the variable explaining imports is not significant; it has no effect on gross domestic product. Otherwise, an increase in domestic exports and investment leads to an increase in economic growth. In some cases, imports are seen as an important channel for foreign technology and knowledge to flow into the domestic economy. Because new technologies could be embodied in imports of intermediate goods such as machines and equipments and labor productivity could increase over time that workers acquire the knowledge of the new embodied technology. But in the case of Japan, this is very different, because Japan's huge industrial strength, which is home to more sophisticated machinery producers, such as cars and electronic machines operating, iron and nonferrous metals, ships, chemicals, food and artifacts. Take agriculture, forestry and fishing in Japan space of thirteen percent of the land, and Japan accounted for about fifteen of the global share of the fish, which puts it in second place after China. Since 2010, the labor force was formed in Japan of 65.9 million workers, and the unemployment rate in Japan is very low and is almost 4 percent, in 2007 it was about twenty million Japanese, or about seventeen percent of the population lives below the poverty line. These results provide evidence that exports and domestic investment, thus, are seen as the source of economic growth in Japan.

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