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Effect of Foreign Direct Investment on Economic Growth: New Evidence from OECD Countries*

Wang, Mengzhen[1]
Ph.D, Department of International Trade, Jeonbuk National University

Choi, Baek-ryul[2]
Professor, Department of International Trade, Jeonbuk National University

He, Yugang[3]
Ph.D, Department of International Trade, Jeonbuk National University

Abstract

To verify the impact of foreign direct investment on economic growth in OECD countries, this study adopts a two-way fixed-effect model to analyzes panel data composed of twenty-six OECD countries from 2007 to 2017. The literature based on the relationship of foreign direct investment on economic growth had no consensus. This study uses the latest data to provide strong evidence for the growth effect of foreign direct investment. The empirical results confirm that foreign direct investment, domestic investments, exports, and human capital are positively associated with economic growth. Although, the growth impacts of domestic investments and exports are higher than that of foreign direct investment. It also illustrates that foreign direct investment is one of the important channels to promote economic growth. The findings suggest that policymakers need to create a suitable economic environment, like maintaining macroeconomic stability and reducing the market distortion, to attract foreign direct investment and then provide policy support to increase domestic investments and exports.

Keyword : Foreign Direct Investment, Domestic Investment, Economic Growth, Fixed Effect model

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1. First Author, wang.1994622@gmail.com
2. Corresponding Author, brchoi@jbnu.ac.kr
3. Co-Author, 1293647581@jbnu.ac.kr

1. Introduction

Through globalization, countries have become increasingly interconnected, which has facilitated the mobility of capital and labor. Additionally, multinational enterprises can determine the geographic locations based on the needs of their production activities. For instance, factories are established in developing countries that can utilize abundant unskilled labor at low prices. R&D centers are started in developed countries with usable ample amounts of skilled labor. Developing countries host multinational enterprises' overseas factories to increase local employment, thereby achieving economic growth. For this reason, developing countries are committed to attracting foreign direct investment. Moreover, stable developing countries also invest outward in upgrading industrial structures and seeking new engines of growth. These countries conduct cross-border Mergers and Acquisitions or directly invest in technology industries in developed countries. Thus, foreign direct investment is critical to economic growth, and the literature studying its effects has only grown.

Foreign direct investment is a combination of capital inflows and technology. Its composition explains that foreign direct investment could affect economic growth in a direct or indirect way (Baiashvili and Gattini, 2020; Li and Liu, 2005). First, as a kind of capital inflow, foreign direct investment directly affects recipient countries' economic growth. Aghion et al. (2016) state that a country can grow faster by investing more in human capital, physical capital, and R&D. Second, foreign direct investment indirectly affects economic growth as one channel of technological diffusion. Iamsiraroj (2016) illustrates that foreign direct investment promotes growth by strengthening industry connections within a domestic economy, increasing productivity.

Research on the relationship between foreign direct investment and economic growth is still a contested field. Many previous studies use samples composed of developing countries. Overwhelmingly, their findings indicate that foreign direct investment is positively associated with economic growth (Makki and Somwaru, 2004; Fadhil and Almsafir, 2015; Herzer, 2012). However, when several studies used samples composed of developed countries, the results were indefinite. Thus, the impact of foreign direct investment on economic growth requires further investigation. Moreover, this paper's contribution is that our sample uses

the latest data that can be collected. In light of changing rapidly in the international investment environment, it will be beneficial to grasping investment objectives and the formulation and changes of policies.

Our work provides new evidence of illustrating the growth effects of foreign direct investment. The sample was composed of twenty-six OECD countries from 2007 to 2017. The empirical results revealed that foreign direct investment, exports, human capital, and domestic investments have a positive impact on economic growth. The labor force and domestic savings have no significant impact. Compared with domestic investment and exports, the growth impact of foreign direct investment was relatively weak. We speculate that it may be due to the high volatility of foreign direct investment flows. Our findings highlight the importance of crafting a suitable macroeconomic environment to attract foreign direct investment and provide adequate policy supports for increasing domestic investment and exports.

This paper is organized as follows: Section 2 reviews the previous studies about the relationship between foreign direct investment with economic growth; section 3 develops the methodology, including model setting and variables; section 4 reports the empirical results; section 5 shows the conclusion.

2. Literature Review

In general, foreign direct investment flowed into recipient countries will affect productivity, employment creation, technological diffusion, thereby impacting economic growth. Yet, there are no common consensuses regarding this issue between different studies. The absence of common consensus can be due to the different periods, countries, and econometric methods employed in these studies. So working on this issue is still required.

Many studies have confirmed the growth effect of foreign direct investment. For instance, Azam and Ahmed (2015) construct a panel regression based on an endogenous growth model. The authors adopt both fixed and random effect models, and their data covers ten CIS countries from 1993 to 2011. They found that both foreign direct investment and human capital development are critical for economic growth. Still, they overlook the possibility of the endogeneity problem between foreign direct investment and economic growth. Other studies

have adopted different econometric methods, like simultaneous system equation techniques, generalized method of moments approach, etc. Li and Liu (2005) identified a significant endogenous relationship between foreign direct investment and economic growth from the mid-1980s onwards using single and simultaneous equation models. Their data was composed of 84 countries over the period 1970-1999. Foreign direct investment in their work was positively associated with economic growth for developed and developing countries. Similarly, Iamsiraroj (2016) adopted simultaneous system equation techniques using a sample composed of 124 countries from 1971 to 2010 and confirmed the growth effect of foreign direct investment in developing and developed countries.

The generalized method of moments approach has also been effectively used to solve the endogeneity problem. Bhavan et al. (2011) use panel data from four South Asian countries from 1995 to 2008 to examine the growth effect of foreign direct investment with the system generalized method of moments. They showed that foreign direct investment has a significantly positive impact on economic growth. When the sample changed from a group of countries to a particular country, Fadhil and Almsafir (2015) also reported similar results. Their work showed that foreign direct investment inflows with human capital positively affect economic growth in Malaysia.

Although many studies have confirmed the growth effects of foreign direct investment, other work has provided different results. Certain authors have even implied that foreign direct investment harms economic growth. Herzer (2012) used a panel cointegration approach to test the impact of foreign direct investment on economic growth in 44 developing countries. Herzer revealed the negative growth effects of foreign direct investment on average, but with vast differences across countries resulting from government intervention, business freedom, foreign direct investment volatility, and primary export dependence. Additionally, Adams (2009) adopted panel OLS and the fixed-effect model to explore the impacts of foreign direct investment, domestic investments on economic growth using the panel data composed of 42 SSA countries from 1990 to 2003. The results from the fixed-effect model illustrated that foreign direct investment harmed economic growth. Using sectoral data, Khaliq and Noy (2007) examined the impact of foreign direct investment on Indonesia's economic growth from 1997 to 2006. Their estimations concluded that foreign direct investment composition matters for its effect on

economic growth. The mining and quarrying sector showed a robust negative impact.

Rarely studies reported that foreign direct investment had no impact on economic growth. Carbonell and Werner (2018) examined whether foreign direct investment improved Spain' s economic growth by using time-series data from 1984 to 2010. The results confirmed that there was no evidence of foreign direct investment contributing to economic growth.

Besides, other studies have been done with non-linear analysis. Chowdhury and Mavrotas (2006) tested the causality relationship between foreign direct investment and economic growth from 1969 to 2000 for three countries: Chile, Malaysia, and Thailand. Their work found strong evidence of a bi-directional causality relationship in both Malaysia and Thailand. Iqbal et al. (2010) investigated the causality relationship between foreign direct investment, trade, and economic growth in Pakistan using quarterly time-series data from 1998 to 2009. They revealed a bi-directional causality relationship. Tiwari and Mutascu (2011) used panel data from 23 developing Asian countries from 1986 to 2008 to examine the non-linearities impact of foreign direct investment and exports on economic growth. Their work conveyed that both foreign direct investment and exports had a positive effect on economic growth. Further studies have considered different macroeconomic variables and analyzed their catalytic impact on the relationship between foreign direct investment and economic growth, such as domestic financial development, trade, domestic investment, human capital, exports, etc. (Li and Liu, 2005; Choong, 2012; Makki and Somwaru, 2004; Bengoa and Sanchez-Robles, 2003). Table 1 in the Appendix represents the studies on the relationship between foreign direct investment and economic growth mentioned before.

3. Methodology and Variables

Based on the previous literature, one conclusion that can draw is that the“core explanatory variables“ for economic growth identified in these and other studies include investment, population growth, and human capital (Li and Liu, 2005; Azam and Ahmed, 2015). We will expand based on Li and Liu (2005) and Ullah and Rauf (2013) to develop our model. The domestic savings variable, which may stimulate economic

growth through increased investment, is used in our primary model. And, the exports mentioned in the literature are also added. The model is specified below :

$$(1)\ Growth_{it} = \beta_0 + \beta_1 \in v_{it} + \beta_2 FDI_{it} + \beta_3 EX_{it} + \beta_4 Human_{it} + \beta_5 Labor_{it} + \beta_6 Saving_{it} + u_i + \lambda_t + \epsilon_{it}$$

Where “i“ indicates country, and “t“ denotes time t. “Where “i“ indicates country, and “t“ denotes time t. “ϵ_{it}“is the error term of regression. “u_i“ and “λ_t“ represent the country- and the period-specific effects. The ratio of foreign direct investment net inflows to GDP is a proxy variable for foreign direct investment, which is appeared as “FDI.“ The data were collected from the Unctad statistic database.

“Growth“ denotes GDP growth rate. “Inv“ represents domestic investments, and it is measured by the ratio of gross capital formation to GDP. Exports marked as “EX“ in our model are measured by the ratio of exports of goods and services to GDP. Labor denotes the employment to population ratio, total. Human capital is represented by the gross enrollment ratio for secondary school, marked as “Human.““Saving“ denotes domestic savings, which is the ratio of gross domestic savings to GDP. All data were collected from the World Bank WDI. The sign for all the explanatory variables is expected to be positive.

4. Empirical Results

4.1. Basic Statistics

After sorting out the thirty-six OECD countries’ data and removing the missing values, left only twenty-six countries. Thus, in this paper, panel data is used for these 26 OECD countries over the period 2007 to 2017. One of the core questions regarding the sample is that of the heterogeneity problem. Even if these countries are members of the OECD, it is undeniable that significant differences exist in these countries’ characteristics. In turn, the heterogeneity problem caused by country variation needs to be reflected in selecting the model.

Before running a regression, we observed the distribution of the data set. The descriptive statistics are reported in Table 2 of the Appendix. The panel data combines cross-section data with time-series data, requiring confirmation of

whether the panel data is stable. There are many ways to test the panel unit root. According to the assumption about the unit root process, these ways can be divided into two groups. We will choose one from each group. One is the Levin, Lin & Chu test which assumes a common unit toot process, and the other one is the ADF test which assumes an individual unit root process. The panel unit root test results are both reported in Appendix Table 2. The results reject the null hypothesis and show that these variables are stable.

To avoid a spurious regression, we also checked the multicollinearity problem between the explanatory variables. The correlation result is reported in Appendix Table 3. The correlation coefficients between any two variables were not above 0.7[1], illustrating no multicollinearity issues.

4.2. Model Selection

The results of the panel ordinary least square are shown in Appendix Table 4. The panel heteroskedasticity LR tests of the residuals reject the null hypothesis, which is that the residuals are homoskedasticity. In other words, it illustrates that both cross-section and period in our sample exist the heteroskedasticity problem. The panel ordinary least squares estimator is still unbiased in the presence of heteroscedasticity, but it is inefficient.

The heteroscedasticity problem is a critical concern for solving in our analysis, and one of the major reasons resulting in the heteroscedasticity problem is from the omitted variables. The random-effect or the fixed-effect models can control it, and the only difference between these two models is the assumption of the unobserved variables. In the random-effect model, the assumption is that the unobserved variables are uncorrelated with all the observed variables. In contrast, the fixed-effect model assumes that the unobserved variables are correlated with someone' s observed variables. The Hausman test can be used to select the model. The result rejected the null hypothesis that the random-effect model is preferred. It is shown in columns 3 of Table 4. Thus, the fixed-effect model was found to be more suitable for the sample.

1. Dormann, C.F. et al. (2013) illustrated that all approaches tested yielded degraded predictions under the change in collinearity structure and the 'folk lore'-thresholds of correlation coefficients between predictor variables of $|r| > 0.7$ was an appropriate indicator.

As mentioned before, the heteroscedasticity problem exists in both cross-section and period, then referring to the result of the Hausman test in the one-way fixed-effect model reported in columns 3 of Table 4. The two-way fixed-effect model is more befitting for our sample. The unobserved variables can be divided into three parts: individual time-invariant variable, "u_i", like country characteristics; period individual-invariant variable, "λ_t", like financial crisis; and individual time-varying variables, "ϵ_{it}."

4.3. Main Results

The two-way fixed-effect model reported in columns 4 of Table 4 revealed that foreign direct investment has a significantly positive impact on economic growth. In other words, a one percentage point increase in foreign direct investment is associated with a 0.06 percent point increase in GDP growth rate. The result confirmed our expectations, and it is consistent with Iamsiraroj (2016), Makki and Somwaru (2004), Freckleton et al. (2012). Moreover, compared to the one-way fixed-effect model results, the absolute value of all variables' coefficients in the two-way fixed-effect model is relatively smaller. It illustrates that period individual-invariant variable, like the financial crisis of 2007-2008, has a notable impact on all countries' economic growth.

Meanwhile, it is easy to notice that domestic investments have contributed the most to economic growth, followed by exports and foreign direct investment. The result provides strong evidence that the contribution of foreign direct investment to economic growth is much lower than exports and domestic investments in OECD countries. These empirical results are similar to those of Pegkas (2015), who also confirmed that the growth effect of foreign direct investment was small with using a sample composed of 18 European countries over the period 2002 to 2012. According to the OECD's statistics, foreign direct investment flows into OECD countries showed a U-shaped curve from 2007 to 2017. The reason maybe is that the 2008 financial crisis and European debt crisis influenced the global macroeconomic stability and the economic growth speed, thereby affecting the volatility of foreign direct investment.

It also provides strong evidence that exports have a significant positive impact on economic growth. These results are the same as many economists with

evidence that exports are one of the growth engines of the economy. For instance, Mahadevan (2007) alludes to how foreign trade expansion contributes to economic growth through increased economies of scale in the export sector. Also, human capital is positively associated with economic growth. It is consistent with Li and Liu (2005), Azam and Ahmed (2015), Ahmed et al. (2011). However, the proxy variables for the labor force and domestic savings had no significant economic growth impact.

To confirm the robustness of our results, we change another proxy variable for economic growth. In the above empirical part, we used GDP growth rate to measure economic growth. However, in some studies, they selected the growth rate of GDP per capita as the proxy variable for economic growth, such as Bengoa and Sanchez-Robles (2003), Li and Liu (2005), Azam and Ahmed (2015), Makki and Somwaru (2004). The result is reported in column 5 of Table 4. we can find that the sign of the results is consistent with that of the previous empirical results, and these coefficients have only slight changes. Thus, we can confirm that foreign direct investment is positively associated with economic growth in 26 OECD countries.

5. Conclusion

To verify the relationship between foreign direct investment and economic growth, we set up panel data of 26 OECD countries from 2007 to 2017 and implemented a two-way fixed-effect model. Our results prove that foreign direct investment, exports, and domestic investments are positively associated with economic growth. Human capital also has a significantly positive impact on economic growth. In turn, the significance level of domestic savings and labor force is greater than 10 percent, which is not statistically significant.

Although the results show that foreign direct investment's growth effect is smaller than that of domestic investment and exports, it is also important for promoting economic growth. For policymakers, these results highlight that holding macroeconomic stability and reducing the market distortions is necessary for creating a better environment to attract foreign direct investment and improve the efficiency of utilizing foreign direct investment. Meanwhile, it also emphasizes that the role of domestic investments and exports on economic

growth is important and can not be ignored.

This study adopted a two-way fixed-effect model, which is a static model, to analyze the relationships between foreign direct investment and economic growth. We think of expanding a static model to a dynamic model in future research. In addition to the macroeconomic variables discussed above, a country's business environment, institutions, and other socio-economic factors that did not include in our model will also affect economic growth. These limitations help us to improve our future research.

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Appendix

<Table 1> Researches on the foreign direct investment-economic growth relationship

FDI effects on Economic Growth	Sources	Data Span	Empirical Approach	Remarks
Significant (Positive)	Li and Liu (2005)	84 countries (21 developed countries 63 developing countries) over the period 1970-99	Fixed effect model and simultaneous equation model	From the mid-1980s onwards, foreign direct investment has a positive impact on economic growth in both developed and developing countries
	Bhavan et al. (2011)	4 south Asian countries (developing countries), 1995-2008	System generalized method of moments (System GMM)	A gravity model equation is used to analyze the determinants of foreign direct investment.
	Pegkas (2015)	18 Eurozone countries 2002-2012	Panel cointegration techniques FMOLS and DOLS	The decline in the share of intra-EU in total EU inward would seem to suggest a lack of confidence on the part of EU investors in their own regional market and the shift from European countries towards greater outward FDI to the world outside the EU.
	Azam and Ahmed (2015)	10 CIS countries From 1993 to 2011	Fixed effect model and Random effect model	Human capital development are also critical to economic growth.
	Fadhil and Almsafir (2015)	Malaysia(developing country) Annual data from 1975 to 2010	Hierarchical Multiple Regressions	FDI flows together with the human capital development contribute strongly to the host country' s economic growth.
	Iamsiraroj (2016)	124 countries from 1971 to 2010 (including developed countries and developing countries)	Simultaneous system equation techniques	The countries are divided into Latin America and the Caribbean; Asia and Australasia; Africa and the Middle East; North America and Western Europe.
Null	Chowdhury and Mavrotas (2006)	Chile, Malaysia, Thailand time-series data From 1969 to 2000	Toda-Yamamoto causality test	A strong evidence of a bi-directional causality relationship is found in both Malaysia and Thailand. In Chile, GDP causes FDI and not vice versa.
	Iqbal et al. (2010)	Pakistan Quarterly time-series data from 1998 to 2009	VAR model and VECM causality test	The results of VECM causality test find bidirectional causality between foreign direct investment, export and economic growth, with are two important factors that enhance the affect of economic growth in Pakistan.
	Tiwari and Mutascu (2011)	23 developing Asian countries over the period 1986 to 2008	Two-way effect model and Random effect model	Foreign direct investment and exports enhance economic growth. By the way, labour and capital also play a important role in economic growth.
Negative	Khaliq and Noy (2007)	Indonesia(developing country) Sectoral data from 1997 to 2006	Fixed effect model	The beneficial impact of FDI is no longer apparent across sectors. The mining and quarrying sector showed a robust negative impact.
	Herzer (2012)	44 developing countries from 1970 t0 2005	Heterogeneous panel cointegration techniques	FDI has, on average, a negative effect on growth in developing countries, but with a large cross-country differences in the growth effects of FDI.
Ambiguous	Adams (2009)	42 SSA countries 1990-2003	Panel OLS and Fixed effects model	The positive impact of foreign direct investment only appear in the panel OLS. The FDI is negatively associated with domestic investment.
	Carbonell and Werner (2018)	Spain Time -series data from 1984 to 2010	Panel OLS and Two-stage Least Squares	No evidence of foreign direct investment contributing to economic growth.

<Table 2> Descriptive Statistics

	Growth	EX	Labor	Inv	Saving	Human	FDI	GDP per capita growth
Mean	1.75	50.75	56.26	22.84	25.26	108.07	2.76	1.30
Median	2.12	45.06	56.77	22.73	24.43	103.76	2.13	1.55
Max.	11.09	95.11	75.42	41.45	43.11	163.94	31.72	-14.27
Min.	-14.81	22.40	42.35	12.37	10.69	84.91	-12.02	12.41
Std.Dev.	3.26	18.98	6.08	4.10	5.69	15.44	3.48	3.27
Obs.	286	286	286	286	286	286	286	286
Levin, Lin & Chu t*	-25.07 (0.00)	-12.78 (0.00)	-24.58 (0.00)	-30.53 (0.00)	-26.17 (0.00)	-5.27 (0.00)	-8.14 (0.00)	-21.03 (0.00)
ADF Test	212.14 (0.00)	175.06 (0.00)	130.14 (0.00)	256.38 (0.00)	175.32 (0.00)	92.12 (0.00)	167.95 (0.00)	217.43 (0.00)

<Table 3> Correlation

	Growth	EX	Labor	Invx	Saving	Human	FDI
Growth	1						
EX	0.10* (0.09)	1					
Labor	0.17*** (0.00)	-0.20*** (0.00)	1				
Inv	0.35*** (0.00)	0.18*** (0.00)	0.15*** (0.01)	1			
Saving	0.20*** (0.00)	0.38*** (0.00)	0.36*** (0.00)	0.60*** (0.00)	1		
Human	-0.01 (0.93)	0.07 (0.21)	-0.01 (0.90)	-0.10 (0.10)	-0.09 (0.15)	1	
FDI	0.18*** (0.00)	0.05 (0.38)	0.11* (0.07)	0.18*** (0.00)	0.05 (0.44)	0.07 (0.24)	1

Notes: *, **, *** denote significance at level 10%, 5%, 1%, respectively

<Table 4> Analysis Results

	(1)Panel OLS	(2)Random Effect	(3)One-way Fixed Effect	(4)Two-way Fixed Effect	(5)Robustness test Two-way Fixed Effect Independent variable : GDP per capita growth rate
FDI	0.09* (1.69)	0.09** (1.98)	0.10** (2.03)	0.06* (1.98)	0.05* (1.75)
Saving	-0.07 (-1.40)	-0.03 (-0.65)	0.19 (1.38)	0.17 (1.66)	0.16 (1.59)
Human	0.00 (0.09)	0.02 (1.58)	0.08*** (3.77)	0.04* (1.92)	0.04* (1.86)
EX	0.02* (1.63)	0.03** (2.43)	0.29*** (3.95)	0.19** (2.70)	0.20*** (2.99)
Labor	0.09** (2.51)	0.09*** (2.57)	-0.09 (-0.83)	-0.03 (-0.40)	-0.09 (-1.10)
Inv	0.28*** (4.98)	0.32*** (6.92)	0.72*** (9.03)	0.61*** (7.48)	0.60*** (6.82)
Constant	-9.20*** (-3.79)	-13.46*** (-5.82)	-37.16*** (-4.74)	-27.69*** (-3.89)	-25.39*** (-3.60)
Adjusted-R square	0.14	0.16	0.52	0.74	0.74
Hausman Test		184.61***	25.96***		
Panel cross-section heteroskedasticity LR Test	102.51 (0.00)				
Panel period heteroskedasticity LR Test	228.34 (0.00)				
Obs.	286	286	286	286	286

<Table 5> Sample country

Country Name				
Austria	Finland	Italy	Norway	Sweden
Belgium	France	Korea	Poland	Switzerland
Chile	Germany	Latvia	Portugal	United Kingdom
Czech Republic	Hungary	Lithuania	Slovakia	
Denmark	Iceland	Mexico	Slovenia	
Estonia	Israel	New Zealand		

외국인직접투자가 경제성장에 미치는 영향: OECD 국가 대상으로*

왕몽진[1]
전북대학교 무역학과 박사과정

최백렬[2]
전북대학교 무역학과 교수

하육강[3]
전북대학교 무역학과 박사과정

요 약

본 연구는 외국인직접투자가 경제성장에 미치는 영향을 분석하기 위하여 26개 OECD 국가를 대상으로 2007년부터 2017년까지의 패널 데이터를 사용하여 고정효과모형을 설정하여 분석했다. 기존 연구에서 외국인직접투자 및 경제성장은 아직 불분명한 관계이어서 본 연구에 비교적 최근의 데이터를 사용하여 측정하려 한다. 실증분석 결과로는 외국인직접투자, 국내투자, 인적자본 및 수출은 모두 경제성장에 긍정적인 영향을 미치는 것으로 나타났으나, 국내투자 및 수출보다 외국인직접투자가 경제성장에 미치는 긍정적인 영향은 비교적 작다고 판단된다. 이외에는 국내저축 및 노동력 변수는 통계적인 의미를 가지지 않음으로 나타났다. 따라서 안정적인 거시경제 환경을 유지하기 위한 정책적인 지원 등을 취함으로써 외국인직접투자 유치에 힘을 기울려야 하며, 수출 촉진 및 국내투자 증대를 장려하는 정책적인 조치도 필요하다.

핵심주제어 : 외국인직접투자, 국내투자, 경제성장, 고정효과모형

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1. 제1저자, wang.1994622@gmail.com
2. 교신저자, brchoi@jbnu.ac.kr
3. 공동저자, 1293647581@jbnu.ac.kr

