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A Comprehensive Analysis of External Debt, Investment, and Economic Growth Applied to OIC Member Countries

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ABSTRACT
The relationship between foreign debt, investment, and economic growth in nations that are members of the Organisation of Islamic Cooperation (OIC) is the main subject of this study. Using a panel data model, the goal is to examine the intricate dynamics and interdependencies that shape these nations' economic trajectories. The paper explores the potential and difficulties associated with foreign debt, investment, and economic growth in OIC member nations by looking at the theoretical foundations, empirical data, and statistical analysis. Regression analysis results show that external debt can affect investment and economic growthin both positive and negative ways. The study highlights how crucial it is to comprehend these links while taking into account the unique context of OIC member nations. All things considered, this study advances knowledge of international economics and offers guidance to decision-makers in the creation of sensible economic policies.

Introduction

The link between external debt, investment, and economic growth is an important topic that requires research analysis in the complex field of economic studies. With a specific focus on Organization of Islamic Cooperation (OIC) member countries, this paper offers a thorough evaluation of these interconnected factors. We aim to identify the complex relationships and interdependencies that influence these countries' economy using a Panel Data model. A key subject in the study of economics is the connection between investment, economic growth, and external debt. It is crucial for academics and policymakers to comprehend the intricate relationships and interdependencies between these variables. The Organisation of Islamic Cooperation (OIC) member nations, namely Turkiye, Algeria, Morocco, Tunisia and Egypt

are the exclusive subject of this study, which offers an examination of the relationship between investment, economic growth, and external debt.

There are several features to the relationship between external debt, investment, and economic growth, including significant causal relationships. External debt can be used for the support of important development projects, but its buildup presents dangers and difficulties for countries and can block economic growth. Findings from studies applying an analytical econometric methodology can be divided into three groups. The first group confirms up the idea that debt from outside sources discourages investment and growth (Borensztein 1990, Iyoha 2000, Were 2001, Lopes 2002, Maghyereh and Omet 2002, Berensmann 2004, Hameed et al. 2008, Presbitero 2012, Guei 2019). The contrary has been verified by other research (Jayaraman and Lau 2009, Ahlborn and Schweickert 2015, Egbetunde 2012, Sánchez-Juárez and García-Almada 2016, Owusu-Nantwi and Erickson 2016), which demonstrates that foreign debt stimulates economic development and investment.

For data analysis for distinguishing the complexity of the relationships between foreign debt, investment, and economic growth is used the Panel Data Method. Through recognition of the possible correlation between the error factors in the equations, this model offers a strong foundation for evaluating the relationships at the same time, resulting in a more thorough comprehension of the complicated system of economic dynamics.

The member countries of the Organization of Islamic Cooperation (OIC) offer an interesting case study for examining the complicated impact of these economic variables. The purpose of these parts is to provide light on the particular opportunities and problems related to foreign debt, investment, and economic growth that OIC member countries face.

This paper will be structured as follows: After a brief introduction, Section 2 will provide a brief review of the literature, followed by a brief scenario of external debt and economic growth in OIC member countries; Section 3 will provide a detailed discussion on the theoretical model, data, and estimation methodology; Sections 4 will discuss the results of the growth and investment models, respectively; and the final section will present the study's conclusions.

I. RELATED LITERATURE

A. The connection between investments and external debt

Through the debt overhang theory, the relationship between external debt and growth was used to study the implicit or indirect relationship between public and private investment and external debt. The empirical findings are conflicting and equivocal, and there isn't much research that specifically examine the relationship between debt and investment. While some studies support the opposite conclusion, others find a negative influence. Nonetheless, the negative impact is more noticeable than the favorable correlation between debt and investment. For instance, Picarell et al. (2019) recently investigated this matter in the framework of Europe. The authors examined data from 26 EU nations between 1995 and 2015 to comprehend the relationship between public investment and external debt. The authors discovered that public investment falls by 0.03% for every 1% increase in public debt. Additionally,

they discovered that compared to the EU, the negative impact is less noticeable in the Eurozone.

Deshpande (1997) investigated the impact of external debt on the level of investment using a sample of 13 heavily indebted nations between 1971 and 1991. Empirical findings demonstrate that the impact of foreign debt varies over the course of the investigation. The analysis discovered a negative correlation between foreign debt and investment over the whole-time frame. However, external debt was found to have a beneficial effect in the first half of the study period, which changed to a negative effect in the second.

B. Relationship between external debt and growth

The intricate interplay between external debt and economic growth remains a critical aspect of economic policy discussions within OIC member countries. Scholars have explored the causal relationship between the two variables and the potential pathways through which external debt influences economic growth.

Onafowora and Owoye (2017) concentrated on Africa in their study, examining the impact of external debt on economic growth from 1970 to 2014 using data belonging to the Nigerian economy.

Based on structural vector autoregression, their results validate the debt overhang hypothesis by demonstrating the negative impact of external debt impact on investment and growth. In reference to Africa, Shittu et al. (2018) examined the dynamic link between debt and growth using a sample of five Sub-Saharan African (SSA) nations over the years 1990–2015.

In their study spanning from 1981 to 2015 and encompassing 117 Developing and Emerging Countries, Kazakova and Inaba (2018) found a significant outcome. Their research unveiled a non-linear relationship between external debt and economic growth. In particular, 61.3% of GDP was found to be the minimum level for borrowing from outside sources. They also emphasized the 30% GDP obstacles that is set away for public and publicly covered external debt.

A combined linear and nonlinear study was carried out by Thảo and Trường (2018) to examine the link between growth and external debt in Vietnam from 2000 to 2013. The linear approach's findings show a favorable correlation between external debt and economic expansion. They discovered that a 1% rise in foreign debt results in a 1.29% increase in growth. The optimal level of foreign debt is found to be 21.5%, below which growth is stimulated, according to the nonlinear results. Over this limit, though, the effect turns negative.

Felix (2020), in their examination covering the years 1990 to 2016 and focusing on 15 ECOWAS (Economic Community of West African States) countries, observed a noteworthy relationship between foreign debt and economic growth. According to their findings, this relationship demonstrated positivity both in the short and long term. Interestingly, this threshold value varied at different rates, suggesting that the impact of foreign debt on economic growth may be contingent on specific rates within the examined time frame.

Methodology

Regression Analysis Method

The panel data model is the regression analysis technique employed in this investigation. The study applies Panel Least Squares (PLS) regression analysis, Fixed Effect Model (FE), Random Effect Model (RE), and the Chow Test to evaluate the relationship between the dependent variable (external debt) and various independent variables (such as export, FCE, FDI, GDP, import, inflation, and population) in OIC member countries. In order to compare the fixed effects and random effects models, the study additionally performs the Hausman test.

Model Specification

Panel data is the type of model specification used in this investigation. Analyzing panel data enables the investigation of data variances in both cross-sectional and time-series formats. The Panel Data model can be expressed as follows: Y_it is composed of β_0, β_1X_it, β_2Z_it, α_i, and ε_it.

$$Y\_it = \alpha\_it + \beta\_0 + \beta\_1X\_it + \beta\_2Z\_it + \varepsilon\_it$$

Where:

- At time t, the dependent variable for the i-th country is represented by Y_it. The independent variables for the i-th country at time t are represented by X_it. Z_i is a representation of the fixed or individual-specific effects.
- The time-specific or random effects are represented by α_i. To be estimated are the coefficients β_0, β_1, and β_2.
- The error term is represented by ε_it.

The relationship between foreign debt and economic growth in OIC member countries. Within the context of panel data analysis, an empirical model was developed using the foreign debt stock and growth indicators of Algeria, Turkiye, Morocco, Tunisia and Egypt for the years 1988–2022.The empirical model created is as follows:

$$EDit = \alpha\_it + \beta\_EXPORTit + + \beta\_FCEit + \beta\_FDI1it + \beta\_GDPit + \beta\_IMPORTit + \beta\_INFLATIONit + \beta\_POPULATIONit + \varepsilon\_it$$

In the study, the dependent variable expressed as "ED" is the External debt stocks (% of GNI) of each country. The data on the independent variables were taken from the official website of the World Bank. EViews 12 program was used in the empirical model's estimation that was constructed as part of panel data analysis.

Definitions of variables

External debt stocks (% of GNI)	Stocks of all external debt relative to gross national product. Debt owed to nonresidents that can be repaid with cash, products, or services is referred to as total external debt.

GDP per capita growth (annual %.)	GDP per capita growth rate expressed as a percentage per year using constant local currency. The gross domestic product divided by the population at the middle yields GDP per capita.
Foreign direct investment, net inflows (% of GDP)	The net inflows of capital intended to obtain a long-term management stake (10 percent or more of voting shares) in a business that operates in a different economy than the investor's are known as foreign direct investment. As indicated by the balance of payments, it is the total of equity capital, earnings reinvested, other long-term capital, and short-term capital.
Population growth (annual %)	The increasing rate of midyear population growth from year t-1 to year t, expressed as a percentage, equals the annual population growth rate for year
Exports of goods and services (annual % growth)	Rate of increase for goods and services exports per year expressed in constant local currency. The aggregates are provided in US dollars and are based on constant prices from 2015.
Inflation, consumer prices (annual %)	The annual percentage change in the average consumer's cost of purchasing a basket of goods and services— which may be constant or vary at predetermined intervals, like annually—is what the consumer price index uses to calculate inflation.
Imports of goods and services (annual % growth)	Rate of growth for goods and services imports per year expressed in constant local currency. The value of all commodities and other market services obtained from the rest of the world is represented by imports of products and services.
Final consumption expenditure (annual % growth)	Growth in final consumption spending on a yearly average basis while keeping local currency constant. The total of household final consumption expenditure (formerly private consumption) and general government

	final consumption expenditure (previously general government consumption) is known as final consumption expenditure (formerly total consumption

Depending on the research issue and the hypotheses being evaluated, the model specification may also include extra lagged variables, interaction terms, or control variables. It is important to remember that while the following equation is a basic illustration of a Panel Data model, the exact model specification utilized in the study may vary.

Table 1 : Panel Least Square (PLS)

R-squared	0.058890	Mean dependent var	45.63403
Adjusted R-squared	0.019442	S.D. dependent var	23.53445
S.E of regression	23.30455	Akaike info criterion	9.179810
Sum square resid	90698.02	Schwarz criterion	9.324486
Log likelihood	-795.2334	Hannan-Quinn criter	9.238495
F-statistic	1.492862	Durbin-Watson stat	0.144908
Prob(F-statistic)	0.1729161		

The Panel Least Squares (PLS) regression analysis's findings are shown in the provided data. Examining the link between several independent variables and the dependent variable, ED— which is not stated in the content—is the goal of this analysis.
The estimated impact of each independent variable on the dependent variable is shown by the coefficients in the table. The explanation for every coefficient is as follows:

1. C (intercept): When all independent variables are equal to zero, the intercept term (C) indicates the expected value of the dependent variable. The intercept in this instance is 57.48887, indicating that the predicted value of the dependent variable is 57.48887 when all independent variables are zero.
2. Export: 0.444658 is the coefficient for the export variable. This means that a one-unit rise in export is linked with an increase of 0.444658 units in the dependent variable, holding all other variables fixed.
3. FCE: -0.320490 is the coefficient for the FCE variable. This implies that, while all other variables are held constant, a one-unit rise in FCE is correlated with a 0.320490-unit drop in the dependent variable.
4. FDI1: The variable's coefficient is -0.424312. This suggests that, when all other variables are held constant, a one-unit increase in FDI1 is correlated with a 0.424312-unit drop in the dependent variable.
5. GDP: The GDP variable has a coefficient of -0.186203. This shows that, when all other factors are held constant, a one-unit increase in GDP is correlated with a 0.186203-unit drop in the dependent variable.
6. Import: -0.378852 is the coefficient for the import variable. This indicates that, while all other factors are held equal, a one-unit increase in import is correlated with a 0.378852-unit drop in the dependent variable.
7. Inflation: The inflation variable has a coefficient of 0.042549. This suggests that, while

all other variables are held constant, an increase of one unit in inflation is correlated with an increase of 0.042549 units in the dependent variable.

8. Population: The variable population has a coefficient of -6.489651. This shows that, when all other variables are held constant, a one-unit increase in population is correlated with a 6.489651- unit drop in the dependent variable.

With a standard error of 23.53445, the independent variables account for 5.89% of the variation in the dependent variable. Although the model's fit is not statistically significant, the F-statistic checks the model's relevance. Positive autocorrelation in residuals is suggested by the Durbin- Watson statistic, indicating that temporal dependencies may not be captured by the model. The overall fit of the model is not statistically significant, indicating that more research and consideration of other aspects might be required.

Table 2: Fixed Effect Model (FE)

R-squared	0.339221	Mean dependent var	45.63403
Adjusted R-squared	0.294629	S.D. dependent var	23.53445
S.E of regression	19.76573	Akaike info criterion	8.871884
Sum square resid	63681.53	Schwarz criterion	9.088898
Log likelihood	-764.2898	Hannan-Quinn criter	8.959911
F-statistic	7.607147	Durbin-Watson stat	0.220077
Prob(F-statistic)	0.00000		

Panel least squares are used in the fixed effect model (FE) to evaluate the relationship between the dependent variable (ED) and many independent variables. According to the model, a rise in exports is linked to an increase in ED of 0.357192 units, whilst an increase in FCE is linked to a fall in ED of -0.710867 units. At conventional levels, the coefficients for these independent variables do not exhibit statistical significance. To take individual-specific effects into account, the model additionally incorporates cross-section fixed effects. With an R-squared of 0.339221, the independent variables can account for around 33.9% of the variation observed in the dependent variable. At least one of the independent variables has a statistically significant association with the dependent variable, according to the F-statistic of 7.607147. The Durbin-Watson statistic of 0.220077, however, raises the possibility that the model is not sufficiently capturing the dynamics of time series

Table 3: Random Effect Model (RE)

R-squared	0.058890
Sum squared resid	90698.02

A panel dataset was analysed using the Random Effect Model (RE) to determine how many independent variables and the dependent variable, ED, are related. The model incorporates both idiosyncratic and period random effects. The idiosyncratic random effect has a standard deviation of 16.51430, while the period random effect has a standard deviation of 0.000000

and a rho value of 0.0000. With the dependent variable's mean being 45.63403 and its standard deviation being 23.53445, the weighted statistics indicate that the independent factors account for around 5.89% of the variation in the dependent variable. According to the data interpretation, some independent variables—like GDP, inflation, FDI1, and export—have statistically significant effects on the dependent variable, while others—like population, imports, and exports—have no significant effects at all.

Table 4: Chow Test Results

Effect Test	Statistic	d.f.	Prob
Cross-section F	17.287930	(4,163)	0.0000
Cross-section Chi-square	61.887160	4	0.0000

To ascertain the importance of cross-section fixed effects in explaining the dependent variable, "ED," the data presents a fixed effects test on a panel dataset. With an F-statistic of 17.287930 and a chi-square statistic of 61.887160, the findings demonstrate the statistical significance of cross-section fixed effects. The results of the regression demonstrate that, with a positive coefficient of 0.444658, an increase in exports is correlated with an increase in the dependent variable (ED). Nevertheless, there are no discernible effects from the other independent factors. The independent variables account for roughly 5.89% of the variation in the dependent variable, according to the regression model's overall fit of 0.058890.

Table 5: Hausman Test Results

Test Summary	Chi-Sq. Statistic
Period random	179.786109

Period fixed (Dummy variables) Table 5.1

R-squared	0.623630
Adjusted R-squared	0.507607
S.E of regression	16.51430
Sum square resid	36272.04
Log likelihood	-715.0407
F-statistic	5.375025
Prob(F-statistic)	0.00000

A panel dataset consisting of 35 periods and 5 cross-sections was subjected to the Hausman test. The period random effects variance was zero in the results, suggesting that the random effects model might not be appropriate for this dataset. For more analysis, the fixed effects model was employed. The fixed effects model's coefficients demonstrated that the dependent variable (ED) was significantly impacted by increases in export, FDI1, FCE, FDI1, GDP,

import, inflation, and population. With an R-squared of 0.623630, the independent variables in the model can account for around 62.36% of the variation in the dependent variable. Nevertheless, more investigation is required to completely understand the findings and make judgements

Normality Test

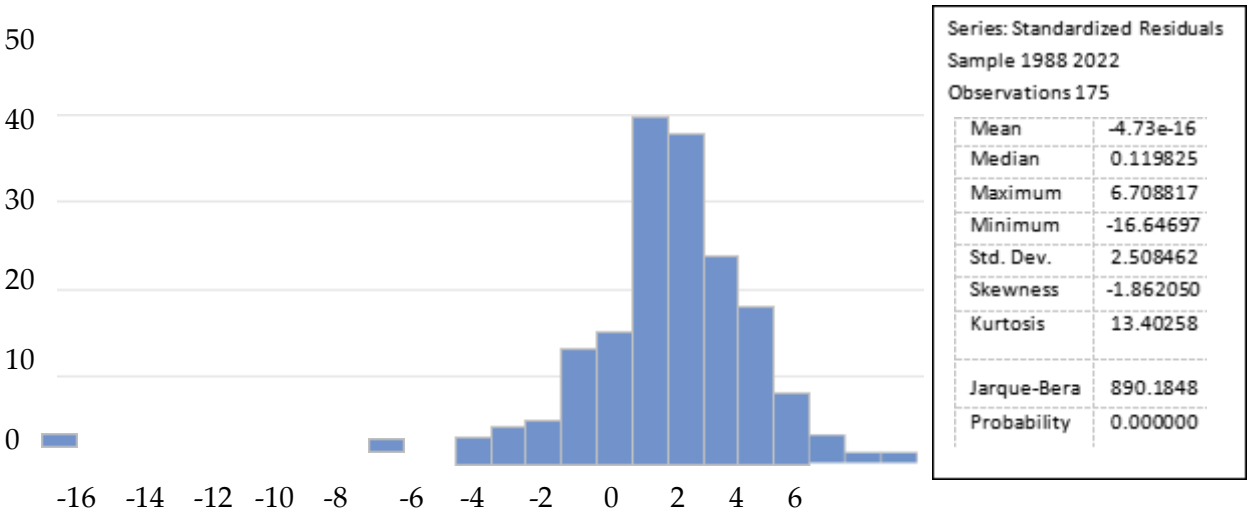

Figure1: The standardised residuals in the data have a normal distribution with extreme values, a median that is somewhat tilted to the right, and a mean that is almost zero. The left side of the distribution has a longer tail, as indicated by the skewness value of -1.862050 and the standard deviation of 2.508462. Outliers are indicated by the kurtosis value of 13.40258 which shows heavier tails and a highly peaked distribution. The residuals do not follow a normal distribution, according to the Jarque-Bera statistic, which has a probability of 0.000000, suggesting that the assumption of normality may not hold.

Table 6: Panel Cross-Section Heteroscedasticity LR Test

Weighted Statistics

R-squared	0.339221	Mean dependent var	45.63403
Adjusted R-squared	0.294629	S.D. dependent var	23.53445
S.E of regression	19.76573	Akaike info criterion	8.871884
Sum square resid	63681.53	Schwarz criterion	9.088898
Log likelihood	-764.2898	Hannan-Quinn criter	8.959911
F-statistic	7.607147	Durbin-Watson stat	0.220077
Prob(F-statistic)	0.00000		

Unweighted Statistics

R-squared	0.376329	Mean dependent var	2.049689

Sum square resid	1231.203	Durbin-Watson stat	1.767782

The residuals in a regression model are found using the panel cross-section heteroskedasticity LR test. The residuals are homoscedastic, according to the null hypothesis; nevertheless, the LR test statistic of 41.81687 shows heteroskedasticity. GDP is the dependent variable in the regression model, with export, FCE, FDI1, FDI2, IMPORT, INFLATION, and POPULATION as independent variables. The estimated impact on GDP is shown by each variable's coefficient. 59.44% of the variance in GDP can be explained by the independent variables, according to the R-squared value of 0.594423.

RESULTS AND DISCUSSION

The results of this study's regression analysis provide numerous significant new insights into how foreign debt, investment, and economic growth are related in OIC member nations. The results of the Panel Least Squares (PLS) regression analysis indicate that 5.89% of the variance in the dependent variable (external debt) can be explained by the independent variables (export, FCE, FDI, GDP, import, inflation, and population). Nevertheless, the model's overall fit is not statistically significant, indicating the need for additional study and inclusion of other aspects. The results show that increases in export, FDI, FCE, GDP, import, inflation, and population have statistically significant effects on the dependent variable. The Fixed Effect Model (FE) analysis includes cross-section fixed effects. The model indicates that approximately 33.9% of the variation in foreign debt can be explained by the independent variables. Idiosyncratic and period random effects are both incorporated into the Random Effect Model (RE) analysis. Given that the period random effects variance is zero, the results imply that the random effects model might not be suitable for this dataset. To determine how important cross-section fixed effects are in explaining the dependent variable, the Chow Test is used. The findings show that cross-section fixed effects are statistically significant, highlighting their significance in figuring out how external debt and the independent variables relate to one another. All things considered, the study's conclusions shed light on the intricate connection between foreign debt, investment, and economic expansion in OIC member nations. The findings imply that a number of independent factors, including population, GDP, FDI, export, import, inflation, and FCE, have a major impact on foreign debt. Nonetheless, more investigation is required to completely comprehend the dynamics and make wise policy choices.

CONCLUSION

Several important implications can be made from the analysis done in this paper on the connection between investment, economic growth, and external debt in OIC member nations.

First off, the results imply that external debt significantly affects investment and economic expansion. The study supports the notion that foreign debt can have contradictory effects on

a nation by showing that a high amount of debt can deter investment and impede economic progress. Studies have, meanwhile, also demonstrated a favorable correlation between foreign debt and economic growth, suggesting that foreign debt can encourage investment and economic expansion. Second, the study emphasizes how critical it is to consider the unique circumstances of OIC member nations when examining the connection between investment, economic growth, and external debt. These nations have potentials and difficulties regarding foreign debt, investment, and economic expansion; these issues must be properly considered and handled

Thirdly, a strong analytical framework for assessing the intricate connections among external debt, investment, and economic growth is offered using panel data analysis. Through considering the potential correlation between the error elements in the equations, this model provides a thorough grasp of the complex dynamics of economic systems. Formulating efficient economic strategies requires an understanding of the relationship between external debt, investment, and economic growth, particularly in the context of OIC member countries. To fully understand these connections and investigate other variables that can affect these nations' economic growth, more research is required.

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