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Panel Data Analysis of the Impact of External Debt on Economic Growth and Inflation: The Case of Emerging Market Economies

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Abstract: This study aimed to analyze the impact of external debt on economic growth and inflation for emerging market economies for the period 1995-2020 using the panel data method. To this end, the study used the data on 12 countries listed in the Morgan Stanley Capital Index (MSCI) Emerging Markets Index. The results of the panel cointegration analysis showed that changes in external debt stock affect economic growth in the opposite direction and inflation rate in the same direction. According to the country-specific results of the panel cointegration analysis, external debt had a negative impact on economic growth in all countries except Mexico, Egypt, India, and Türkiye. External debt increased inflation in all countries except China, Egypt, India, South Africa, and Thailand. The Bootstrap panel causality test results showed a unidirectional causality from economic growth to external debt stock in China, India and Thailand, and a bidirectional causality in China. A unidirectional causality was also found from external debt stock to inflation in Colombia, and a unidirectional causality from inflation to external debt in China, India, Peru, and Thailand. Based on the cointegration analysis results, it is recommended that external debt should be used to finance more productive investments in order to ensure sustainable economic growth in Brazil, China, Colombia, Indonesia, Peru, Philippines, South Africa, and Thailand. The panel causality test results also showed that economic growth in China, India, and Thailand requires more external resources. Based on these results, it is recommended to reduce external debt in order to reduce inflation in Brazil, Colombia, Indonesia, Mexico, Peru, Philippines, and Türkiye.

Keywords: economic growth; emerging market economies; foreign debt; inflation; panel data analysis.

JEL classification: F34; F43; C33.

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1. INTRODUCTION

External debt is more important in underdeveloped and developing countries than in developed countries. Underdeveloped/developing countries need to invest in order to complete their economic development and achieve sustainable economic growth. Inadequate domestic savings, which constitute the source of financing for investments in underdeveloped/developing countries, force these countries into external debt. In other words, especially in underdeveloped and developing countries, external debt is also referred to as external resources. However, external resources should be used by these countries to finance productive investments. Therefore, external resources obtained by developing countries accelerate economic growth by increasing investments and savings (Moreira, 2005, p. 27).

On the other hand, the impact of external debt on the general level of price is also controversial, and there are two opposing views on this issue. The first view argues that external debt will have an inflationary effect on the economy. In other words, if the revenues obtained through external debt are used for consumption, aggregate demand and the general level of prices will rise. In addition, the continuous rise in external debt will adversely affect export revenues and cause the economy to enter an inflationary process. In other words, the pressure to increase exports in order to pay off external debt will reduce export revenues by causing the prices of export goods to fall in international markets. A country with declining export revenues will try to increase the amount of exports in order to increase its revenues, but the limited production capacity of the country will lead to a decrease in the domestic supply of goods. Failure of domestic supply of goods to meet domestic demand will also lead to an increase in the general level of prices. Moreover, a country with increasing external debt will try to finance this debt through domestic debt and money printing. These financing methods will cause an inflationary effect in the economy (Şeker, 2006, pp. 83-84). According to the second view, external debt will cause a contractionary effect on the economy and lead the economy to enter a deflationary process. In other words, new resources provided by external debt will reduce the price of old debts, thus affecting the value of money. Thus, the yield on the new debt will increase, the increased yield will spread to the whole economy, and a deflationary effect will occur in the economy (İnce, 2001, p. 349).

This study aims to analyze the relationship between external debt, economic growth and inflation for emerging market economies for the period 1995-2020 using the panel data method. The main characteristics of emerging market economies are listed as follows: they have high growth rates, their population growth is rapid and hence their per capita income remains the same, they have a technology importing structure, and they need foreign investments to meet the capital they need to complete their economic development processes. The aforementioned characteristics of these countries and the insufficiency of domestic savings to finance their development lead these countries to external debt. Therefore, in this study, 25 countries listed in the Morgan Stanley Capital Index (MSCI) Emerging Markets Index were selected as emerging market economies in order to investigate the relationship between external borrowing and economic growth and inflation. However, since the relevant data for some countries could not be obtained, 12 countries were included in the model in this study. These countries are Brazil, China, Colombia, Egypt, India, Indonesia, Mexico, Peru, Philippines, South Africa, Thailand, and Türkiye.

A review of the literature reveals that although there are many studies analyzing the relationship between external debt and economic growth for developing countries, there is no

consensus on this issue and there are not many studies analyzing the relationship between these three macroeconomic variables. However, since domestic savings are insufficient in emerging market economies, external debt is an important source for financing development in these countries. Therefore, it is important to analyze the effect of external debt on growth for this group of countries. Additionally, a review of the literature shows no study analyzing the relationship between external debt, growth and inflation for emerging market economies. Given the gap in the literature, this study investigated the relationship between external debt-growth-inflation for 12 selected emerging market countries given the importance of external debt for emerging market economies. These aspects reflect show the originality of the study and its contribution to the literature. The following sections of the study are organized as follows. Section 2 presents the empirical studies in the literature, Section 3 presents the data set and analysis method, Section 4 presents empirical findings, and the Final Section presents the conclusion and policy recommendations.

2. EMPIRICAL LITERATURE

It is generally observed that studies analyzing the external debt-growth relationship are more frequent. In the theoretical literature, the examination of the external debt-growth relationship gained importance with the debt crisis in Latin America in the 1980s, and the number of empirical studies on this relationship started to increase in the 1990s. Among these studies, Geiger (1990) analyzed the debt-growth relationship between 1974 and 1986 for nine South American countries using regression analysis. The author concluded that there is a statistically significant and inverse relationship between debt burden and growth.

Cunningham (1993) analyzed the debt-growth relationship in 16 highly indebted developing countries for the period 1971-1979 using the least squares method (LSM). The results of the analysis show that there is a statistically significant and negative relationship between debt burden and growth. For 20 middle-income developing countries, Afxentiou (1993) analyzed the debt-growth relationship with Granger causality test for the period 1971-1988 and found that there is a negative relationship between the two variables. Afxentiou and Serletis (1996) investigated the debt-growth relationship in two subperiods, 1970-1980 and 1981-1990, using panel data method for 55 developing countries between 1970-1990. The results of the methodology show that there is no negative relationship between debt and growth in the 1970-1980 period, while there is a strong negative relationship in the 1981-1990 period. Fosu (1996) analyzed this relationship in Sub-Saharan African countries for the period 1970-1986 using the LSM method and concluded that debt service payments reduce output growth by reducing productivity. Fosu (1999) reanalyzed this relationship in 35 Sub-Saharan African countries for 1970-1986 using the LSM method. According to the results of the analysis, outstanding debts have a negative impact on economic growth.

Chowdhury (2001) analyzed the debt-growth relationship in 35 heavily indebted poor countries (HIPCs) and 25 non-heavily indebted poor countries using panel data method. The results show that there is a negative causality from debt to growth for both country groups. Lin and Sosin (2001) investigated the relationship between public external debt and the growth rate of gross domestic product (GDP) per capita in 77 countries using cross-sectional data analysis. Grouping countries into industrialized countries, African countries, Latin American countries, Asian countries and other countries and taking the period 1970-1996 as the period of analysis, the authors found different results in terms of country groups. The

authors conclude that there is a statistically significant and negative relationship in African countries, a negative but statistically insignificant relationship in industrialized and Latin American countries, and a statistically insignificant positive relationship in Asia and other countries. Were (2001) who examined the impact of external debt on growth in Kenya for the period 1970-1995, used regression analysis as the method of analysis. The results of the analysis revealed that external debt has a negative impact on economic growth by reducing private sector investments.

Pattillo *et al.* (2002) investigated the external debt-growth relationship for 93 developing countries between 1969 and 1998 using panel data analysis. The findings show that external debt has a negative impact on growth when the external debt stock/export ratio exceeds 130-170 per cent or the external debt stock/GDP ratio exceeds 34-40 per cent. Clements *et al.* (2003), who analyzed the external debt-growth relationship with the help of the Generalized Method of Moments (GMM) with the data of 55 low-income countries for the period 1970-1999, concluded that external debt has an indirect negative effect on growth by affecting public investment. Pattillo *et al.* (2004) analyzed this relationship in 61 developing countries for the period 1969-1998 using dynamic panel data and GMM method. The results show that external debt has a strong negative impact on both physical capital accumulation and total factor productivity and hence there is a negative relationship between external debt and growth. Using panel data and GMM method with data from 48 developing countries for the period 1970-1998, Moreira (2005) found that the relationship between external debt and growth is positive. Wijeweera *et al.* (2005) investigated the theory of debt overhang for Sri Lanka for the period 1952-2002 using cointegration analysis and VECM. The results show that Sri Lanka does not have a debt overhang problem as its total external debt burden is not high. In other words, the authors conclude that there is a statistically insignificant negative relationship between external debt and growth in the long run and no significant relationship in the short run.

Ayadi and Ayadi (2008) analyzed the debt-growth relationship for Nigeria and South Africa for the period 1980-2007 using the LSM and generalized LSM methods. The results of the analysis show that external debt has a negative impact on growth for both countries analyzed. Bakar and Hassan (2008) analyzed the debt-growth relationship by using the Vector Autoregression (VAR) model with Malaysian data for the period 1970-2005 and found that external debt has a negative impact on economic growth in the short run. Adesola (2009) analyzed the relationship between Nigeria's debt payments to multinational creditors and growth for the period 1981-2004 using the LSM method. The results show that there is a statistically significant and positive relationship between Nigeria's debt payments to Paris Club creditors and growth. The author also finds that there is a statistically significant and negative relationship between debt payments to the London Club and other creditors and growth.

Malik *et al.* (2010), who analyzed the external debt-growth relationship for Pakistan using the LSM method with data from 1972-2005, found that there is a statistically significant and negative relationship between the two variables. R. Ali and Mustafa (2012) analyzed the external debt-growth relationship in Pakistan with data for the period 1970-2010. According to the results of Johansen cointegration test and VECM method, they found that external debt has a negative impact on economic growth in the short and long run. Eratas and Basci Nur (2013), who investigated the external debt-growth relationship between 1990-2010 for 10 emerging market economies with panel data analysis, found that debt has a negative impact on growth.

Examining the external debt-growth relationship with the data of the Nigerian economy for the period 1970-2013 with the Auto Regressive Distributed Lag (ARDL) model, the

VECM method and the Granger causality test, Ada *et al.* (2016) reached conclusions that external debt negatively affects economic growth. Senadza *et al.* (2017) investigated the external debt-growth relationship in 39 Sub-Saharan African countries using the GMM method. The results of the analysis show that external debt has a negative impact on growth. Kharusi and Ada (2018) analyzed the relationship between external debt and growth for Oman using the ARDL model and VECM method with data for the period 1990-2015 and found that external debt has a statistically significant and negative effect on growth. Anderu *et al.* (2019) analyzed the external debt-growth relationship for Nigeria using the Auto-Regressive Distributed Lag (ARDL) method with data from 1980-2016. According to the results of the analysis, external debt has a significant and important negative impact on economic growth. Zaghdoudi (2020) analyzed the external debt-growth relationship with the dynamic panel threshold model for middle and low-income countries for the period 2002-2016 and concluded that external debt reduces economic growth.

Akinlo (2021) analyzed the relationship between external debt and growth for the Nigerian economy using with the Markov regime switching model and a dataset for the period 1970-2016. The analysis results showed that external debt has a negative impact on economic growth. Dawood *et al.* (2021) analyzed the external debt-growth relationship for 18 Asian Developing and Transition Economies (Asian Developing and Transition Economies) for the period 1995-2019 using the heterogeneous static panel data method. The authors concluded that external debt has a positive effect on economic growth. Ideh and Uzonwanne (2021) analysed the relationship between external debt and growth using the ordinary least square (OLS) technique for Nigeria with a dataset for the period 1985-2019. They found statistically insignificant and negative effects of external debt on economic growth. Issac *et al.* (2021) analyzed the relationship between external debt and growth for Ghana using time series method with a dataset for the period 1991-2019. Granger causality test results showed no causality between external debt and growth. Makun (2021) analyses the external debt-growth relationship for the Fiji economy using linear and nonlinear ARDL method with a dataset for the period 1980-2018. The author concluded that the effect of external debt on economic growth is negative. Mohsin *et al.* (2021) analyzed the external debt-growth relationship for eight South Asian economies with a dataset for the period 2000-2018 using panel ordinary least square (OLS), fixed effect, quantile regression, and robust output regression methods. They found that external debt has a negative effect on growth. Suidarma and Yasa (2021) analyzed the external debt-growth relationship for the Indonesian economy with a dataset for the period 2011-2020 using the vector error correction model. They found that external debt has a statistically significant and positive effect on growth in the long run. Sandow *et al.* (2022) analyzed the external debt-growth relationship for 31 sub-Sahara African (SSA) countries for the period 2005-2017 using the system-generalized method of moment (system GMM) and panel smooth transition regression (PSTR). The analysis results showed that external debt has a negative impact on growth. Oluwaseyi (2023) analyzed the external debt-growth relationship for the Nigerian economy with a dataset for the period 1990-2020 using the VECM method, Granger causality test, and co-integration test. They concluded that external debt negatively affects growth. Ale *et al.* (2023) investigated the external debt-growth relationship for five South Asian countries for the period 1980-2020 using the cross-sectional dependence autoregressive distributed lag model (CS-ARDL) method. The authors reported that external debt has a statistically significant and negative impact on growth in both the short and long run.

When the studies analyzing the relationships between external debt-growth-inflation and external debt-inflation in the related literature are examined, it is seen that there are fewer studies analyzing the external debt-growth relationship. Among these studies, Karakaplan (2009) analyzed the external debt-inflation relationship with unbalanced panel data and GMM method with the data of 121 countries including Latin American countries, high inflation countries, European Union (EU) countries and transition economies for the period 1960-2004. The results show that external debt has less impact on inflation in countries with more developed financial markets. Akan and Kanca (2015) analyzed the external debt-inflation-growth relationship for Türkiye using the Granger causality test and VAR model method for the period 1980-2013. The causality test results show a unidirectional causal relationship from economic growth to inflation and external debt. In the variance decomposition method, they found that a change in external debt has a significant effect on inflation. The authors also found that a growth-rate shock has a strong impact on external debt in the impulse-response functions. Ekinci (2016) analyzes the external debt-inflation relationship in Türkiye using the simple linear regression method and takes the period 2003-2015 as the analysis period. According to the results, inflation rate is negatively affected by external debt. Mweni *et al.* (2016), who investigated the external debt-inflation relationship for Kenya using the LSM method with data for the period 1970-2012, found that external debt has a statistically significant negative effect on inflation according to the Spearman correlation coefficient results. In the regression analysis results, they found that external debt has a statistically positive effect on inflation.

Boukraine (2021) investigated the relationship between external debt, growth and inflation for the Tunisian economy with quarterly data from the period 2010-2019 using the ARDL method. The authors found that external debt has a statistically significant effect on inflation in both the short and long run, while economic growth affects inflation in the long run. Helmy (2022) analyzed the external debt-inflation relationship for Egypt with monthly data for the period 2000-2001 using the ARDL method. The analysis results showed that external debt increases inflation both in the short and long run. Evans (2022) analyzed the relationship between external debt, inflation and growth for Ghana with a dataset for the period 1991-2021 using the Johansen cointegration method and ordinary least squares regression method. The Johansen test results showed that external debt affects economic growth positively and inflation negatively in the long run. M. Ali *et al.* (2023) examined the relationship between external debt-growth-inflation for Pakistan with a dataset for the period 1980-2020 using the ARDL model. The authors reported that external debt and inflation have a negative impact on growth.

3. DATA AND EMPIRICAL METHODOLOGY

In this study, the share of external debt stock in GNP (per cent), GDP (in $ and 2010 constant prices) and consumer price index for inflation rate (based on 2010) for emerging market economies between 1995 and 2020 are included in the models.

Model 1:

$$gdp_{it} = \alpha_i + \beta_1 debt_{it} + u_{it} \quad (1)$$

Model 2:

$$inf_{it} = \alpha_i + \beta_1 debt_{it} + u_{it} \quad (2)$$

In the above models, gdp_{it}, is the GDP of country i in period t, $debt_{it}$ is the external debt stock of country i in period t, and inf_{it} is the inflation rate of country i in period t. External debt stock and growth rate data are obtained from the World Bank, while inflation data are obtained from The United Nations Conference on Trade and Development (2023).

In the study, two models are constructed to analyze the relations between the external debt stock and GDP and inflation. Firstly, a Cross-Section Dependence Test (CD test) is conducted to discern possible cross-sectional dependencies among the series. Such dependencies stem from common stochastic trends across different units or sections and can lead to misleading outcomes in econometric analyses. The homogeneity of the dataset is assessed using the Pesaran and Yamagata (2008) Slope Homogeneity Test, indicative of whether different sections share the same trends and, consequently, can be represented by a universal model.

Non-stationary series can result in spurious regression results in the analysis, so panel unit root tests check whether the series exhibits a constant mean and variance over time. Panel unit root tests can be categorized into three generations. First-generation tests are predicated on the assumption of cross-sectional independence, while second-generation tests consider cross-sectional dependence. Third-generation tests are developed to mitigate additional complexities inherent in the data.

After applying the panel unit root test, it is checked whether there is cointegration among the relevant variables. Cointegration suggests that time series move within a long-term equilibrium relationship, implying that variations in one series can influence others. First-generation panel cointegration tests typically assume cross-sectional independence and treat each individual or entity within the panel as independent. These tests focus solely on the cointegration properties of individual series within the panel. On the other hand, second-generation panel cointegration tests consider the existence of cross-sectional dependence. The choice of which panel cointegration test to use depends on the specific characteristics of the dataset and the research question, just like with panel unit root tests. We used the Westerlund (2007) Cointegration test to estimate a cointegrated relationship among the variables in this study.

When estimating panel cointegration coefficients, it is important to consider both cross-sectional dependencies and heterogeneity in the data. Several tests, like the Cross-sectional Augmented Dickey-Fuller (CADF) test, are developed to account for cross-sectional dependencies. Additionally, approaches such as the Common Correlated Effects (CCE) method and the Pooled Mean Group (PMG) estimator jointly address cross-sectional dependencies and heterogeneity. These techniques contribute to achieving more precise and dependable estimates of cointegration coefficients in panel data analysis. In this study, long-term cointegration coefficients are estimated using the AMG (Augmented Mean Group) method, which gives consistent results even cross-section dependence.

After estimating the long-term coefficients, causality between the variables is tested by Kónya (2006) causality test. This step estimates whether alterations in the values of a certain variable lead to changes in other variables.

4. EMPRICAL RESULTS

Before testing the existence of cointegration among panel data series, it is necessary to test for cross-sectional dependence among the series. The tests to be evaluated differ according to the presence or absence of cross-section and homogeneity. Cross-section

dependence is a crucial consideration in panel data analysis, as it can affect the validity of statistical tests and lead to incorrect inferences. Pesaran (2007) underscores the necessity of accounting for cross-section dependence in both panel unit root testing and cointegration analysis. The presence of cross-section dependence can violate the assumption of independence between observations, a prerequisite for valid statistical inference. Moreover, neglecting cross-section dependence can result in misleading conclusions regarding the long-term relationships between variables, leading to biased and inconsistent estimates. Additionally, cross-section dependence can arise from the presence of cross-unit cointegrating relationships. Therefore, accounting for cross-section dependence is imperative to ensure the accuracy and reliability of cointegration test results (Banerjee *et al.*, 2004).

In this study, Breusch and Pagan (1980), Baltagi *et al.* (2012) bias-corrected scaled LM, Pesaran (2004) scaled LM, and Pesaran (2004) CD tests were applied to test for cross-sectional dependence. The Ho hypothesis test is based on the assumption of "no cross-sectional dependence", where "N" stands for the cross-sectional dimension of the panel data and "T" stands for the time dimension. Since T(26) > N(12) is detected in the data set, the test utilized is the Breusch and Pagan (1980) LM test.

Table no. 1 – Cross-Sectional Dependence Test (CD Test) Results

Variables	Breusch-Pagan LM (1980)	Pesaran scaled LM (2004)	Bias-Corrected Scaled LM (2012)	Pesaran CD (2004)
gdp	455.5533***	33.90626***	33.66626***	18.78800***
cpi	394.2923***	28.57418***	28.33418***	15.74546***
debt	360.3607***	25.62081***	25.38081***	12.00747***

Notes: (*), (**) and (***) denote significance at the 10%, 5% and 1% levels, respectively.
Source*:* authors' estimations

Table no. 1 above presents the results of the cross-section dependence test for the relevant data set. According to the Breusch and Pagan (1980) LM test, the hypothesis H0 cannot be rejected at 1 per cent significance level. There is cross-sectional dependence in the relevant data set and tests that consider cross-sectional dependence are used in unit root and cointegration tests.

In this study,Pesaran and Yamagata (2008) slope homogeneity test is applied to test whether the slope coefficient is homogeneous.

Table no. 2 – Pesaran and Yamagata (2008) Panel Slope Homogeneity Test Results

	Model 1: gdp ~ debt		Model 2: cpi ~ debt	
	Test statistic	p-value	Test statistic	p-value
$\tilde{\Delta}$	3.423	0.001***	4.181	0.000***
$\tilde{\Delta}_{adj}$	3.639	0.000***	4.446	0.000***

Notes: $\tilde{\Delta}$: Delta-Tilde; $\tilde{\Delta}_{adj}$: adjusted Delta-Tilde; *** denotes 1% significant level.

Source: authors' estimations

According to the results of the probability values of the slope homogeneity test in Table no. 2, the null hypothesis H0 "*Slope coefficients are homogeneous*" is rejected at the 1 per

cent significance level and it is determined that the constant term and slope coefficients in the co-integration equation are heterogeneous.

The concept of stationarity refers to the situation when the mean, variance and autocovariance of the relevant series are constant over time and the series converge to a value in the long run. As a result of the non-stationarity of the panel data set, the problem of spurious regression may be encountered. Therefore, the panel data set should be tested with a unit root test. In the literature, panel unit root tests are categorized as "*first generation panel unit root tests*" and "*second generation panel unit root tests*". The tests in the first group can be used in cases where there is no correlation between units, while the tests in the second group can be used in cases of correlation between units (Tatoğlu, 2017, pp. 3-4).

Since there is cross-sectional dependence in the study, the panel unit root test called "cross-sectionally augmented Dickey Fuller (CADF)" is used. In this test,Pesaran (2007) uses the lagged and extended values of the cross-sectional means in the ADF regression. In the CADF regression, they proposed the Cross-Sectionally Augmented IPS (CIPS) test statistic by taking the arithmetic averages of the test statistics after estimating each cross-section. The CIPS test shows an asymptotically standard normal distribution:

$$CIPS = N^{-1}\sum_{i=1}^{N} CADF_i \tag{3}$$

Table no. 3 – CIPS Panel Unit Root Test Results

Variables	**CIPS**	
	Constant	**Constant and trend**
gdp	-3.52***	-3.66**
Δ*gdp*	-4.98***	-4.32***
cpi	-4.27***	-4.44***
Δ*cpi*	-5.63***	-5.59***
debt	-2.45**	-3.12***
Δ*debt*	-4.06***	-4.11***
Critical values:	1%: -2.54 5%: -2.30 10%: -2.18	1%: -3.07 5%: -2.83 10%: 2.71

Notes: The CIPS test is based on the Schwarz Information Criterion with 4 lags. ***, ** and * denote 1%, 5% and 10% significance level, respectively. Δ: Delta denotes the first-difference of the related variable.

Source: authors' estimations

The null hypothesis of the CIPS test is "the series are non-stationary". According to the CIPS test, all variables are stationary at level [I(0)]. It is concluded that none of the variables in the data set of the study is stationary in its second difference [I(2)] (see Table no. 3).

In order to test the cointegration relationship between the variables, the second generation Westerlund (2007) cointegration test, which can be used when the data set is heterogeneous and cross-sectional dependent, is applied. While Gt and Ga values represent group average statistics, Pt and Pa statistics are calculated using information on the entire panel. In case of cross-sectional dependence, the bootstrap version of the test is recommended (Tatoğlu, 2017, pp. 201-203).

In addition to the Westerlund (2007) test, the Gengenbach *et al.* (2016) cointegration test, which is a second generation cointegration test that can be used in the case of heterogeneous data set and cross-sectional dependence, is applied.

Table no. 4 – Westerlund (2007) Cointegration Test Results for Model 1 and Model 2

	Model 1: gdp ~ debt			Model 2: cpi ~ debt		
	Value	**Z-Value**	**Resistant probability**	**Value**	**Z-Value**	**Resistant probability**
Gt	-2.455	-2.611	0.050*	-3.072	-4.989	0.000***
Ga	-10.215	-1.956	0.030**	-15.782	-5.498	0.000***
Pt	-14.312	-9.351	0.030**	-6.129	-1.120	0.330
Pa	-14.487	-8.003	0.010**	-3.754	-0.372	0.530

Notes: The Westerlund (2007) test is based on the Akaike Information Criterion. Robust probability values are estimated with 100 bootstrap cycles. ***, ** and * denote 1%, 5% and 10% significance level, respectively.

Source: Authors' estimations

According to the results in Table no. 4 above, the null hypothesis of the Westerlund (2007) test, which is defined as "no cointegration", is rejected in all values of Model 1 and in Gt and Ga values of Model 2. In other words, there is a long-run cointegrated relationship between variables in both models.

To add to the Westerlund (2007) test, Gengenbach *et al.* (2016) panel cointegration test is applied. The result is displayed in Table no. 5 below.

Table no. 5 – Gengenbach *et al.* (2016) Panel Cointegration Test Results

d.y	**Coefficient**	**T-bar**	**p-Value**
Model 1: gdp ~ debt			
y(t-1)	-0.880	-4.402	<= 0.01
Model 2: cpi ~ debt			
y(t-1)	-0.676	-4.932	<= 0.01

Source: authors' estimations

According to the results in Table no. 5 above, the null hypothesis H0, which states that there is no cointegration relationship for both models, is rejected. In other words, there is a long-run cointegrated relationship in both models.

In panel data analysis, estimating long-term cointegration coefficients is crucial for finding enduring relationships between variables, especially under the cross-sectional dependence and heterogeneity situation. Such estimation allows for a more evident understanding of the underlying economic dynamics across countries and periods. The "Augmented Mean Group (AMG)" estimator developed by Eberhardt and Bond (2009) and Eberhardt and Teal (2010) emerges as a tool for estimating long-term cointegration coefficients in cases of cross-sectional dependence and heterogeneity. Consequently, it allows the analysis of long-term relationships among variables in context.

Table no. 6 – Model 1 - Augmented Mean Group (AMG) Estimation

Model 1: gdp ~ debt	Coefficient	Standart error	Z-Value	P>Z
Panel Overall				
debt	-0.110***	0.021	-5.26	0.00
Country				
Brazil	-0.110***	0.041	-2.67	0.008
China	-0.494***	0.144	-3.43	0.001
Colombia	-0.193***	0.045	-4.31	0.000
Egypt	0.028	0.029	0.99	0.321
India	-0.154	0.186	-0.82	0.410
Indonesia	-0.105***	0.011	-9.25	0.000
Mexico	-0.061	0.068	-0.90	0.366
Peru	-0.208***	0.042	-4.99	0.000
Philippines	-0.120***	0.019	-6.19	0.000
South Africa	-0.044*	0.023	-1.92	0.055
Thailand	-0.105***	0.026	-4.05	0.000
Türkiye	-0.108	0.106	-1.02	0.306

Notes: (*), (**) and (***) denote significance at the 10%, 5% and 1% levels, respectively.
Source: authors' estimations

According to the long-run panel cointegration coefficient results for Model 1 in Table no. 6, if the external debt stock changes by 1 per cent, GDP will change by 0.11 per cent in the opposite direction. Moreover, the related variable is statistically significant at the 1 per cent significance level. In the same table, country-specific AMG results show that the coefficient of the external debt variable is statistically significant and has a negative sign in all countries except Mexico, Egypt, India and Türkiye. External debt affects economic growth negatively in India, Mexico and Türkiye, while external debt affects economic growth positively in Egypt. However, the coefficients of the external debt variable of these countries are statistically insignificant. In other words, the results of the analysis show that external debt has a negative impact on economic growth in all countries except Mexico, Egypt, India and Türkiye.

Table no. 7 – Model 2 - Augmented Mean Group (AMG) Estimated Results

Model 1: cpi ~ debt	Coefficient	Standart error	Z-Value	P>Z
Panel overall				
debt	0.174***	0.062	2.79	0.005
Countries				
Brazil	0.572***	0.199	2.870	0.004
China	0.327	0.229	1.430	0.154
Colombia	0.367***	0.085	4.320	0.000
Egypt	-0.047	0.112	-0.420	0.673
India	0.070	0.200	0.350	0.726
Indonesia	0.270***	0.038	7.060	0.000
Mexico	0.278**	0.119	2.340	0.019
Peru	0.072***	0.027	2.690	0.007
Philippines	0.045**	0.018	2.580	0.010
South Africa	0.038	0.038	1.000	0.317
Thailand	0.023	0.018	1.230	0.218
Türkiye	1.204*	0.697	1.730	0.084

Notes: (*), (**) and (***) denote significance at the 10%, 5% and 1% levels, respectively
Source: authors' estimations

According to the long-run panel cointegration coefficient results for Model 2 in Table no. 7, a 1 per cent change in external debt stock changes the inflation rate by 0.17 per cent in the same direction. Moreover, the coefficient of the related variable is statistically significant at the 1 per cent significance level. When country-specific AMG results are analyzed in the same table, the coefficient of the external debt variable for all countries except China, Egypt, India, South Africa and Thailand is statistically significant and has a positive sign. In China, India, South Africa, and Thailand, the coefficient of the external debt variable is insignificant and positive. In Egypt, the coefficient of the external debt variable is negative but statistically insignificant. In other words, it is concluded that external debt increases inflation in all countries except China, Egypt, India, South Africa and Thailand.

After estimating the long-run coefficients, the causality tests between the variables will be performed with the Kónya (2006) causality test. Kónya (2006) causality test is based on the Seemingly Unrelated Regression (SUR) estimator and Wald tests. Since bootstrap critical values are derived separately for each country, there is no need for cointegration or unit root tests. Bootstrap critical values are compared with Wald statistics, and if the Wald statistic is higher than the bootstrap critical values, the null hypothesis of no causality is rejected. Moreover, the panel does not need to be homogeneous and Granger causality tests can be conducted for each country separately (Kónya, 2006, p. 979).

Table no. 8 – Model 1 - Bootstrap Panel Causality Results

Model 1- H_0: *debt is not the Granger cause of gdp*					
Countries	**Wald statistic**	**1%**	**5%**	**10%**	**H_0**
Brazil	7.324	60.295	31.466	24.239	Not rejected
China	1.906	35.181	22.198	18.006	Rejected
Colombia	5.489	48.773	33.158	27.325	Not rejected
Egypt	11.262	47.935	29.230	22.566	Not rejected
India	10.382	43.490	25.299	19.628	Not rejected
Indonesia	3.263	21.240	11.668	9.024	Not rejected
Mexico	2.547	65.784	41.175	29.762	Not rejected
Peru	15.438	37.698	21.351	16.223	Not rejected
Philippines	5.759	12.684	8.320	6.666	Not rejected
South Africa	23.326	63.760	40.627	29.650	Not rejected
Thailand	5.844	57.669	35.153	27.956	Not rejected
Türkiye	5.249	68.632	42.360	29.331	Not rejected
Model 1- H_0: *gdp is not the Granger cause of debt*					
Brazil	5.258	50.612	31.124	24.443	Not rejected
China	44.002	8.605	6.709	5.818	Rejected
Colombia	3.977	107.564	84.728	73.449	Not rejected
Egypt	4.769	39.254	32.981	30.171	Not rejected
India	18.604	26.995	21.032	18.153	Rejected
Indonesia	5.621	10.556	7.759	6.44	Not rejected
Mexico	6.49	79.325	45.902	34.768	Not rejected
Peru	13.003	48.721	40.172	36.532	Not rejected
Philippines	20.069	34.436	28.277	25.735	Not rejected
South Africa	7.408	3.818	2.539	1.974	Not rejected
Thailand	21.3	11.634	8.749	7.493	Rejected
Türkiye	12.554	61.978	37.301	28.44	Not rejected

Notes: The maximum lag length of the test is 4 and the appropriate lag length is determined according to the Schwarz Information Criterion. Critical values are obtained with 1000 bootstrap cycles. ***, ** and * denote 1%, 5% and 10% significance level, respectively.

Source: authors

According to Table no. 8 above, the null hypothesis stating that "external debt stock is not the Granger cause of GDP" is rejected only for China. In other words, external debt stock is the Granger cause of GDP in China. The null hypothesis stating that "GDP is not the Granger cause of external debt stock" is rejected for China, India and Thailand. In other words, GDP is the Granger cause of external debt stock in India and Thailand. In addition to these results, a bidirectional Granger causality relationship was found only in China. Table 9 below presents the Kónya (2006) panel causality results for Model 2.

Table 9 – Model 2 - Bootstrap Panel Causality Results

Model 2- H_0: *debt is not the Granger cause of cpi*					
Countries	**Wald-statistic**	**1%**	**5%**	**10%**	**H_0**
Brazil	1.129	52.719	31.634	23.712	Not rejected
China	25.677	79.386	51.581	42.105	Not rejected
Colombia	28.971	45.346	29.923	23.12	Rejected
Egypt	16.744	57.842	35.607	26.92	Not rejected
India	9.275	46.515	29.792	22.385	Not rejected
Indonesia	5.745	22.262	13.901	10.469	Not rejected
Mexico	5.609	86.14	39.352	27.513	Not rejected
Peru	10.302	59.045	37.937	30.032	Not rejected
Philippines	0.84	29.699	21.395	17.926	Not rejected
South Africa	20.113	60.668	36.966	27.828	Not rejected
Thailand	4.284	66.423	39.387	29.883	Not rejected
Türkiye	18.601	50.569	30.838	22.959	Not rejected
Model 2- H_0: *cpi is not the Granger cause of debt*					
Brazil	3.467	46.07	28.584	21.879	Not rejected
China	72.578	30.183	17.51	12.76	Rejected
Colombia	9.434	108.299	72.789	59.17	Not rejected
Egypt	7.254	71.282	43.715	33.419	Not rejected
India	23.507	55.795	34.056	26.268	Rejected
Indonesia	7.998	39.145	22.334	16.976	Not rejected
Mexico	10.722	67.793	40.606	30.756	Not rejected
Peru	51.753	85.342	56.978	45.6	Rejected
Philippines	5.885	61.221	40.48	31.56	Not rejected
South Africa	3.431	55.506	36.282	28.868	Not rejected
Thailand	29.345	32.061	19.959	15.446	Rejected
Türkiye	6.511	64.259	38.129	28.606	Not rejected

Note: The maximum lag length of the test is 4 and the appropriate lag length is determined according to the Schwarz Information Criterion. Critical values are obtained with 1000 bootstrap cycles. ***, ** and * denote 1%, 5% and 10% significance level, respectively.

Source: authors

According to Table no. 9 above, the null hypothesis stating that "external debt stock is not the Granger cause of inflation rate" is rejected only for Colombia. In other words, external debt stock is the Granger cause of the inflation rate in Colombia. In the following part of the table, the null hypothesis stating that "Inflation rate is not the Granger cause of external debt stock" is rejected for China, India, Peru and Thailand. In other words, inflation rate is the Granger cause of external debt stock in China, India, Peru and Thailand.

5. CONCLUSION

Since domestic savings are insufficient in emerging market economies, external debt is an important source for financing development in these countries. A review of the empirical literature on the relationship between external debt and growth reveals that although there are many studies on this issue, there is no study analyzing the relationship between external debt, growth and inflation for emerging market economies. Therefore, this study aimed both to fill a gap in the literature and analyze how external debt affects growth and inflation for emerging market economies. For this purpose, the effect of external debt on economic growth and inflation was analyzed for emerging market economies using panel data method with a dataset for the period 1995-2020. Although the study targeted 25 countries in the MSC index, 12 countries were included in the analysis since the relevant data for some countries could not be obtained from the relevant databases.

Results of the cointegration test of Westerlund (2007); Westerlund and Edgerton (2007) and Gengenbach *et al.* (2016) show that there is a long-run relationship between these variables. Panel cointegration coefficient results indicate that external debt affects economic growth in the opposite direction and inflation rate in the same direction. Moreover, the analysis results show that the coefficients of these variables are statistically significant at the 1 per cent significance level. Country-specific panel cointegration coefficient results show that external debt has a negative impact on economic growth in all countries except Mexico, Egypt, India and Türkiye. These results are in line with those reported by Cunningham (1993), Afxentiou (1993), Fosu (1996), Chowdhury (2001), Were (2001), Pattillo *et al.* (2004), Ayadi and Ayadi (2008), Bakar and Hassan (2008), Malik *et al.* (2010), R. Ali and Mustafa (2012), Eratas and Basci Nur (2013), Ada *et al.* (2016), Kónya (2006), Kharusi and Ada (2018), Anderu *et al.* (2019) and Zaghdoudi (2020). However, it is concluded that external debt increases inflation in all countries except China, Egypt, India, South Africa and Thailand. Bootstrap panel causality test results reveal a unidirectional causality from economic growth to external debt stock in India and Thailand and a bidirectional causality relationship in China. Moreover, a unidirectional causality was found from external debt stock to inflation in Colombia, and a unidirectional causality from inflation to external debt in China, India, Peru and Thailand.

According to the cointegration analysis results in this study, in order to achieve sustainable economic growth in Brazil, China, Colombia, Indonesia, Peru, Philippines, South Africa and Thailand, it is recommended to use external debt more to finance productive investments. The panel causality test results also showed that economic growth in China, India and Thailand requires more external resources. The causality test results also showed that greater external borrowing in China leads to economic growth. As a matter of fact, the COVID-19 pandemic, which outbroke in China in 2019, reduced world trade volume and resulted in lower exports and lower domestic demand, thereby reducing the growth rates of the Chinese economy, which has grown rapidly over the last four decades, and further increasing the need for external resources. In recent years, the increase in China's external debt has mostly stemmed from the public sector and non-financial corporations. In order to reduce external debt in China, it has been suggested by the relevant authorities that the public sector should cut its spending on investment projects. However, this suggestion is not recommended either for China or for other emerging market economies, independently of the empirical results obtained in this study.

On the other hand, for the assessment of the effect of external debt on inflation for these countries, policy recommendations were made according to the signs of the coefficients obtained in the long-run cointegration test results rather than the causality test results. In this context, it is recommended to reduce external debt in order to reduce inflation in Brazil, Colombia, Indonesia, Mexico, Peru, Philippines, Peru, Philippines and Türkiye. As a matter of fact, the policy recommendation valid for these countries is also supported by the view in the literature that external debt increases inflation.

However, although the study targeted 25 emerging market countries, the results of the study apply only apply to 12 emerging market countries due to the lack of relevant data for 13 emerging market countries. However, as mentioned earlier, these countries are dependent on external resources to achieve sustainable and stable growth rates due to insufficient domestic savings. In this framework, external debt is an important source of long-term sustainable and stable growth for emerging market countries when it is used to finance productive investment projects by both government and non-financial corporations. However, it can be said that the external debt-inflation relationship for emerging market economies may cause the results to change when data are obtained for the relevant period for all emerging market countries. This situation constitutes a limitation for this study.

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