Does the Reinhart-Rogoff Hypothesis is Applicable for the Upper-Middle-Income Economies?

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Abstract. This paper aims in investigating the appropriateness of the Reinhart-Rogoff hypothesis in the upper-middle-income economies. The hypothesis argues that public debt is good for the economic growth, but it starts to give detrimental effects as the debt to GDP ratio reaches 90 percent. This issue is essential in the midst of the accomplishment of the Industrial Revolution 4.0, in which all countries need to invest in advanced technology, robotics, artificial intelligence, research, and development as well as human capital development. However, the challenge comes when the government is required to spend a tremendous amount of funds for economic and social recovery due to unexpected events, such as tsunami, earthquakes, and floods. Given a limited amount of funds, the governments have to incur huge amount of public debt to support economic growth and development. By using system GMM for the 32 countries in the upper-middle-income economies from 1990 to 2018, it was found that the Reinhart-Rogoff hypothesis is not applicable in the upper-middle-income economies. The economic growth starts to diminish when the ratio of public debt to GDP is more than 70 percent. This study contributes to the policy implication by re-alerting the government not to borrow funds beyond the 70 percent threshold.

Keywords: Economic Growth, Middle-Income Trap, Public Debt, Reinhart-Rogoff Hypothesis, Upper-Middle-Income Economies

1 Introduction

The World Bank has reported that most of the countries in the upper-middle-income economies (UMIE) are in the middle-income trap position [1]. This is proven based on the evidence by the World Bank's statistics from 1990 to 2018, in which only four out of sixty countries in the UMIE have successfully upgraded their status from UMIE into the high-income economies (HIE), namely American Samoa (1989 to 1991), Equatorial Guinea (2009 to 2016), the Russian Federation (2014 to 2016) and Venezuela (2016). Nevertheless, the latest statistics in 2019 show that they were not able to retain the HIE status due to their inability to earn the gross national income (GNI) per capita more than $12,376.

One of the possible reasons is due to the scarcity of capital. As illustrated in Figure 1, the average inflows of foreign direct investments (FDI) and domestic investments for the UMIE show a declining pattern from 2010 to 2017. Lower inflows of investments lead to slower economic growth, which is then translated into lower GNI per capita.

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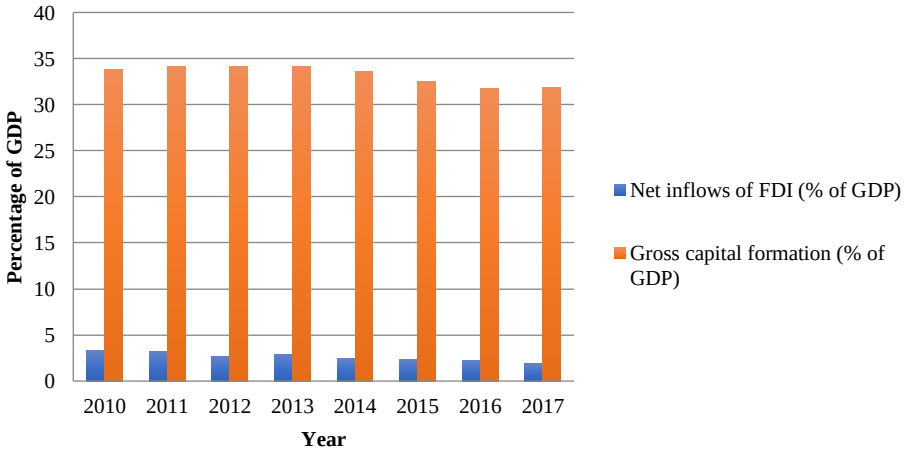

Fig. 1. Average inflows of domestic and foreign investments for the UMIE from 2010 to 2017.

It becomes a greater challenge for the UMIE to uplift their economic status into the HIE if the decline in capital investment is prolonged for a long period of time. As the world is moving towards the accomplishment of the Industrial Revolution 4.0, the UMIE requires a massive amount of funds to be injected in critical areas such as advanced technology, robotics, artificial intelligence, research, and development as well as human capital development. Moreover, the pressure increases as the government has to spend a tremendous amount of funds for economic and social recovery due to unexpected events, such as tsunami, earthquakes, and floods. Moving forward, it is vital for the UMIE to obtain additional capital from other sources, such as public borrowings, either domestically or abroad. The funds borrowed from abroad, or so-called as the external debt, is highly vulnerable [2] relative to the domestic borrowing. It is because of its exposure to external risk and exchange rate risk that are uncontrollable.

Looking at the contribution of external debt to economic growth, there are controversial thoughts on this matter. The Keynesian hypothesis claimed that the external debt helps in stimulating the economic growth if the funds are used for productive expenditure [3], such as education, health, infrastructure development as well as research and development. This hypothesis is supported by vast empirical researches. However, the contradicting opinion, under the classical school of thought, argued that the increase in public debt gives a detrimental effect on economic growth [4] of the country due to three possible reasons. Firstly, it is expected that the government will increase the tax rate or impose new taxes in order to cover the additional burden of taxes [5][6]. It will cause a decline in the purchasing power, hence lowering down the economic growth of a country. Secondly, there will be a crowding-out effect of private investment [7][8] as the demand for loanable funds is greater than its supply. Finally, the savings, which should be saved for the future generation, need to be sacrificed in order to pay the debt burden [9]. In this case, saving funds are not used for productive purposes.

By combining these two schools of thought, Reinhart and Rogoff had developed a Reinhart-Rogoff hypothesis [9], in which they argued that public debt gives both positive and negative effects on economic growth. The turning point from the positive to the negative effect is subject to further discussion. They argued that the turning point is when the ratio of public debt to GDP exceeds 90 percent for five years or more. Their arguments have been empirically tested by various researchers in a different scope of studies using various types of methodologies

[5][10][11]. The answers are not identical. For instance, the turning points for the developing countries were found to be 30 percent [12] and 106 percent [5]. The former authors used mean group as the methodology, while the latter used panel smooth transition regression. Similarly, different thresholds were found in the cases of the advanced countries, from 40 percent [13], 64 percent [14], 80 percent [12] to 90 percent [11][15]. Due to different findings, it is worth investigating how the economic growth of the UMIE is responding when there is an increase in their public debt level. If it is true that public debt gives an adverse effect on economic growth, what is the highest ratio of debt to GDP that the government should hold? This paper aims in answering this question, as it is vital to ensure that the UMIE can stimulate higher economic growth, move out from the middle-income trap position, and upgrade their status into the HIE.

2 Research Methods

In answering the research objective, we used the endogenous growth model [16][17] as a starting point in modeling the economic growth framework. By referring to the endogenous growth model, the economic growth of a country depends on three main elements, namely capital, labor, and human capital. Within the same model, we shall not neglect the role of technological progress in accelerating economic growth. It is captured through savings and investments as the technology is progressing when the country has more savings and investments [18]. By combining all four elements, the baseline growth model for panel data specification is as follows:

$$y_{it} = \alpha + \rho y_{it-1} + \beta x_{it} + \mu_i + \varepsilon_{it} \quad [1]$$

Where y is the economic growth, measured by the real GDP growth per capita, α is a constant term, y_{it-1} is the initial real GDP per capita, x_{it} is a vector of explanatory variables, μ is the individual-specific effects, ε is the error term, while i and t represent country and time, respectively. Meanwhile, β is a coefficient that measures the change in the real GDP per capita due to a unit change in the control variables, while ρ measures how the countries converge to its steady-state level. The inclusion of the initial real GDP per capita (y_{it-1}) is in-line with the convergence hypothesis, in which we expect the ρ to be negative.

As the main aim of this study is to test the Reinhart-Rogoff hypothesis in the case of the UMIE, public debt (EDEBT) is included in equation 1. Since the hypothesis argued that the debt may give positive and negative effects on economic growth, the model is expected to be non-linear. Therefore, we include the EDEBT as a linear and a quadratic term. The new equation is as follows:

$$y_{it} = \alpha + \rho y_{it-1} + \beta_1 EDEBT_{it} + \beta_2 EDEBT^2_{it} + \beta_3 INV_{it} + \beta_4 SAV_{it} + \beta_5 POPG_{it} + \beta_6 HC_{it} + \beta_7 TO_{it} + \beta_8 INF_{it} + \mu_i + \varepsilon_{it} \quad [2]$$

Where EDEBT and $EDEBT^2$ are the focal variables, while the INV, SAV, POPG, HC, TO and INF are the control variables, denoted as x in equation 1. All data are in their actual forms, except for the initial real GDP per capita. It is converted into the logarithm form. The EDEBT is referring to the external debt since it is more vulnerable to economic growth as compared to the domestic debt [2]. The descriptions of the variables and the sources of the data are explained in Table 1.

The inclusion of both linear and quadratic terms of EDEBT is to test the existence of a non-linear relationship between public debt and economic growth as prescribed by the Reinhart-Rogoff hypothesis. Since the debt-growth relationship is widely debated, the sign of β_1 in equation 2 can either be positive [3] or negative [4]. Besides, the non-linear relationship will also exist if the coefficient of β_1 or β_2 is significant. However, adding a square term (EDEBT2) requires close examination in the interpretation. The coefficient of β_2 should not be interpreted directly. Instead, following Kim et al. [19] and Ibrahim & Law [20] , there is a need to calculate the marginal effects of public debt on economic growth using the following formulas.

$$\frac{\Delta y_{it}}{\Delta EDEBT_{it}} = \beta_1 + 2\beta_2 EDEBT \qquad [3]$$

Where the calculation of the marginal effects of public debt on economic growth is relying on the coefficients of both β_1 and β_2.

Table 1. Descriptions of the variables and the sources of the data

No.	Notation	Description of the Variable	Measurement Unit	Source of the Data
1	y	Economic growth, measured by the annual percentage of the growth rate of the real GDP per capita	Percentage	World Development Indicators (WDI)
2	y_{it-1}	Initial real GDP per capita (in logarithm form)	Logarithm	World Development Indicators (WDI)
3	EDEBT	Public debt, measured by the ratio of external debt to GDP	Percentage	International Debt Statistics (IDS)
4	INV	Domestic investment as a proxy of capital, measured by the gross capital formation to GDP.	Percentage	World Development Indicators (WDI)
5	SAV	Savings as a proxy of capital, measured by the ratio of gross savings to GDP.	Percentage	World Development Indicators (WDI)
6	POPG	Population growth as a proxy of labor.	Percentage	World Development Indicators (WDI)
7	HC	Human capital index, as a proxy of human capital.	Index	Penn World Table (PWT)
8	TO	Trade openness, measured by the sum of exports and imports of goods and services to GDP.	Percentage	World Development Indicators (WDI)
9	INF	Inflation rate, measured by using consumer price index.	Index	International Financial Statistics (IFS)

Out of 60 countries in the UMIE in the fiscal year of 2019, only 32 countries were included as the scope of the study due to data availability. The list of chosen countries is shown in

Appendix 1. These countries were chosen as they were classified as the UMIE status with the GNI per capita ranging from $3,996 to $12,375 in the 2019 fiscal year. All the above-listed data were collected from 1990 to 2018. In order to remove the business cycle elements, all data were divided into six, based on the non-overlapping five-year averages following the procedures by previous researchers [5][21]. The removal of the business cycle elements helps in filtering out the serial correlation that always exists as a result of the short-term fluctuations in the business cycle.

This paper applied the system generalized method of moments (GMM) as a methodology to generate findings for three reasons. Firstly, by observing at the number of cross-sections and time periods, it is the most appropriate method [22] since the number of the cross-sections (32) is large while the number of the time dimension is small (6). Secondly, GMM is specifically designed to run a dynamic model. As shown in equation 2, the model itself is a dynamic model due to the inclusion of the lagged variable (y_{it-1}), consistent with the convergence hypothesis in the growth model. Thirdly, the system GMM is able to solve the endogeneity problem that exists in the debt-growth model, by instrumenting the endogenous variables with their lagged values. This matter is crucial as previous literature found the possibility of having an endogeneity problem or a reverse causality between public debt and economic growth [23]. Other methods such as pooled ordinary least square (POLS) fixed effect (FE) and random effects (RE) are incapable of solving the endogeneity problems by using the lagged values of the endogenous variables. These methods are also designed for a static model, that does not take into consideration the convergence hypothesis in the growth model.

Within the system GMM, there are one-step and two-step variants [22]. The one-step estimator uses weighting matrices that are independent of the estimated parameters, while the two-step estimator uses the optimal matrices, in which the moment conditions are weighted by a consistent estimate of the covariance matric. In between the two, the two-step estimator is more efficient relative to the one-step estimator [20]. However, for robustness check, we run the analyses by using both estimators to check the consistency of the results.

In solving the endogeneity problem, the system GMM instrument the endogenous variables with their lagged values. The results will be valid if the instruments are appeared to be exogenous [24]. Hence, Hansen J test is conducted to test to validity of the instruments. The idea is to ensure that the null hypothesis is not rejected (overidentifying restrictions are valid). If this is the case, then the overidentifying conditions are correctly specified, hence the instruments are valid.

Besides, the GMM estimator only allows for the first-order serial correlation if the error terms are serially independent [22]. It is allowed since the model consists of the combination of both level and first difference variables. A higher order of serial correlation illustrates specification error in the model. Therefore, to test for the second-order serial correlation, Arellano-Bond test can be conducted with a null hypothesis of no second-order serial correlation for the disturbances in the first-difference equation. In order to ensure no specification error, the null hypothesis should not be rejected.

Finally, the use of the system GMM requires careful selection of the instruments. By default, the instruments are selected by using all available lags. Too many lags will lead to a high number of instruments. It will cause the estimation bias [25]. In avoiding the estimation bias, the number of instruments should be lower than the number of cross-sections [25]. If not, the number of lags can be reduced by restricting the lags or by collapsing the instruments. By referring to this rule, the number of lags chosen for all analyses in this thesis was based on the multiple series of estimations that involved multiple combinations of lags. The lags that yield the best estimation results were chosen based on the significance of the steady-state

determinants as well as the rules set by Hansen [24], Arellano and Bond [22] and Roodman [25].

3 Results and Discussion

The following table shows the descriptive statistics for all variables used in this paper.

Table 2. Descriptive statistics

No.	Variable	Mean	Standard Deviation	Minimum	Maximum
1	y	2.3247	3.1574	-12.5759	11.2728
2	y_{t-1}	8.5216	0.5431	6.5918	9.5362
3	INV2	24.6799	6.6374	12.6640	49.9950
4	SAV	22.4664	13.3370	-28.0355	56.0171
5	FDI	3.0433	2.6723	-4.1728	18.9154
6	POPG	1.1773	1.1354	-1.5050	5.2075
7	HC	2.5260	0.4273	1.4676	3.4891
8	TO	72.0504	33.6360	15.5664	205.5394
9	INF	1290.6270	16878.6200	-0.1210	232662.3000
10	EDEBT	45.1043	26.8919	1.4447	166.1601

As illustrated in Table 2, huge differences were found between the minimum and the maximum values of TO, INF and EDEBT. This symptom indicates the possible existence of outliers as the data might have extreme values. To ensure robust estimation results, we removed all outliers, as suggested by Abdul Bahri [26]. Altogether, 16 observations were removed based on the Cook's D test, since the Cook's D distance values were larger than the cut-off distance of 0.0211 (based on a formula of 4 divided with 189 total number of observations).

Table 3 illustrates the main findings for this paper, with two models. Model 1 and model 2 show the findings based on the one-step and two-step system GMM estimators, respectively. The non-linear relationship between public debt and economic growth can be seen at the coefficients of the $EDEBT^2$. In both models, the coefficients were negative and significant. It proves the existence of a non-linear relationship between EDEBT and y. In other words, external debt can promote economic growth, but at one point, if the debt is too high, it will give an adverse effect on economic growth.

Table 3. Findings on the relationship between public debt and economic growth

Variables	Notation	Model 1	Model 2
Initial GDP per capita	y_{t-1}	-3.4694***	-3.5374***
		(0.9881)	(0.5998)
External debt	EDEBT	0.1058***	0.1233***
		(0.0378)	(0.0262)
Square of external debt	$EDEBT^2$	-0.0006**	-0.0008***
		(0.0002)	(0.0002)
Gross capital formation	INV2	0.1984***	0.2309***
		(0.0662)	(0.0445)
Gross savings	SAV	0.1139**	0.0987**
		(0.0538)	(0.0402)
Population growth	POPG	-0.6584**	-0.5624**

		(0.3057)	(0.2213)
Human capital	HC	2.6662*	2.2861*
		(1.3754)	(1.1700)
Trade openness	TO	0.0040	0.0057
		(0.0161)	(0.0114)
Inflation	INF	-0.0037***	-0.0034***
		(0.0004)	(0.0002)
Constant		15.5032**	16.4134***
		(6.7997)	(2.4607)
Observations		173	173
Number of countries		32	32
No. of instruments		30	28
Arrelano-Bond test for AR(2) (p-value)		0.1754	0.1040
Hansen (p-value)			0.1873

Notes: ***, ** and * indicate significance at 1%, 5% and 10%, respectively, and values in parentheses are the standard errors. The maximum lags used as instruments were three for lagged dependent variable and other endogenous variables.

Due to the significance of the $EDEBT^2$ in both models, the interpretation of how EDEBT affects y should take into consideration the magnitudes of both EDEBT and $EDEBT^2$. Since there were two models, model 2 is used as the primary model for interpretation since the model was derived from the two-step system GMM, which is more efficient relative to the one-step system GMM [22]. Therefore, the new marginal effects and t-statistics of EDEBT in model 2 were computed based on the covariance matrix [27]. The computations were conducted at the mean, minimum and maximum levels of EDEBT. The results are demonstrated in Table 4.

Table 4. Marginal effects of EDEBT on y

	Marginal Effect	New Standard Error	T-Statistics
Mean	0.05113	0.015147	3.303343***
Minimum	0.12099	0.025685	4.710531***
Maximum	-0.14256	0.06283	-2.26898**

Note: *** and ** indicate significance at 1% and 5%, respectively.

The marginal effects, as shown in Table 4, confirmed the GMM results in Table 3. At the minimum level of public debt (1.4447 percent), the impact of debt on economic growth is positive (0.12099). Similar results can be found at the mean level of public debt (45.1043 percent) since the marginal effect at the mean is still positive (0.05113). It means that as the countries in the UMIE accumulate a higher level of external debt from 1 percent to 45 percent, the countries can expect a positive economic growth but at a diminishing rate (from 0.12099 to 0.05113 percent). Nevertheless, if they keep accumulating more debt, it might have an adverse effect on economic growth. It is be proven by looking at the marginal effect of debt at the maximum level, in which the effect is negative (-0.14256). It happened when the debt reached a maximum level of 166 percent (Jordan).

The next question that arises here is how much debt the UMIE should consider, so that the economic growth is not compromised. Figure 2 gives the answer to this question. Figure 2 illustrates the marginal effects of EDEBT on y based on the results generated by using the two-step system GMM (model 2). The y-axis is the marginal effect, while the x-axis is the values of EDEBT. The spikes in black show the number of countries based on certain EDEBT level. For

instance, at the EDEBT level of 30 to 35, a lot of spikes were accumulated there, indicating that there were many countries in the UMIE that have EDEBT levels between 30 to 35 percent. On the below part of the figure, the histogram shows a similar pattern. The solid sloping line in the figure shows the marginal effects of public debt on the economic growth of the UMIE at each point of EDEBT. In contrast, the dotted lines illustrate the 95 percent confidence intervals. The marginal effects are statistically significant when the upper and lower bounds of the confidence intervals are not equal to zero. The sloping line and the confidence intervals stopped at EDEBT equal to 100. The reason being is because the other data of EDEBT beyond 100 percent were removed due to the outliers (the cases of Bulgaria and Jordan).

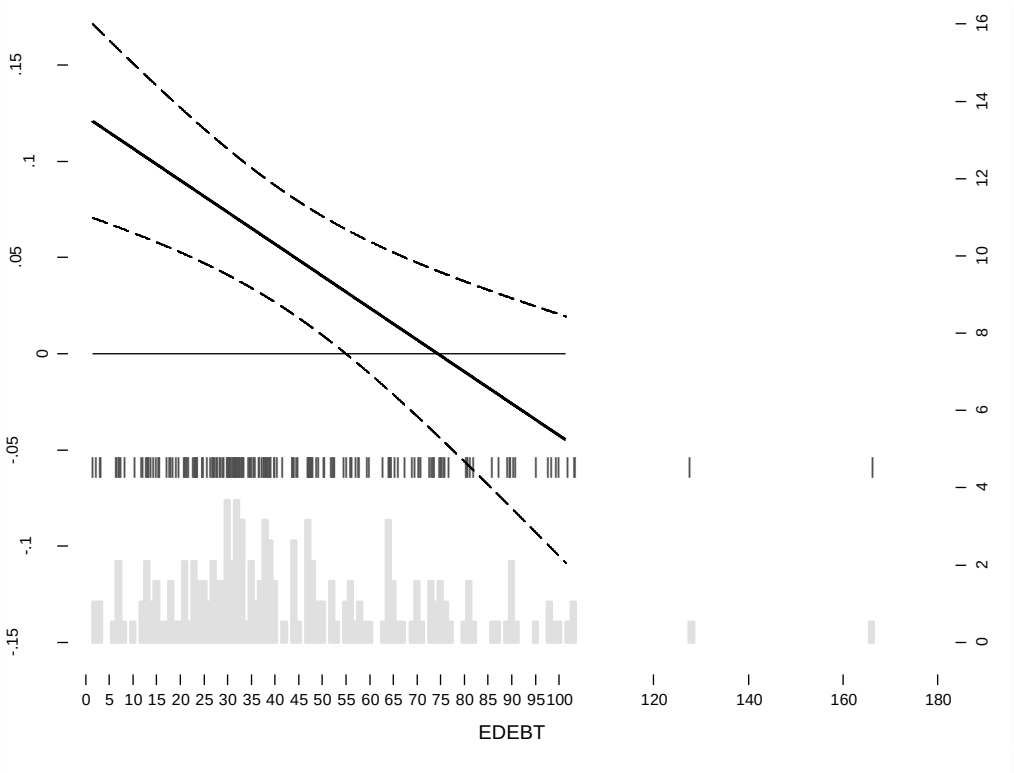

Fig. 2. Marginal effect of EDEBT on y.

Looking at the above figure, it is easy to conclude that public debt has a positive effect on economic growth when the EDEBT level is lower than 70 percent. The lower the EDEBT, the higher the economic growth of the countries. Based on 32 countries under investigation, 27 of them were having average EDEBT of lower than 70 percent since 1990 to 2018. These countries, including Malaysia (48.32 percent) are expected to have a positive effect on economic growth since the EDEBT level does not exceed 70 percent. However, if the EDEBT level is beyond 70 percent, an increase in the EDEBT will hurt economic growth. Five countries have the average EDEBT higher than 70 percent from 1990 to 2018, namely Belize (70.26 percent), Serbia (72.12 percent), Jamaica (80.37 percent), Bulgaria (85.54 percent) and Jordan (104.38 percent). Apart from these countries, four more countries are expected to join the list, namely Albania, Armenia, Kazakhstan, and Mauritius. It is because the average EDEBT from 2015 to 2018 for these

countries were exceeding 70 percent. These findings confirmed the validity of the Reinhart-Rogoff hypothesis, but with a different turning point. The turning point for the UMIE is at 70 percent, while the Reinhart-Rogoff hypothesis found that the threshold is at 90 percent.

Among the possible reasons for the turning point are due to the crowding-out effect on the private investment [7][8] as well as the expectation that the government will increase tax rate as the debt increases [5][28]. Firstly, the governments in highly indebted countries are expected to soak up the available investment funds to finance the existing debt. Given that the supply of loanable funds is very limited, the available funds are not enough to cater to the needs of private investors. As a result, the private sector might not be able to truly participate in the economy, hence lowering down their contribution to the economic growth of the countries. Secondly, as the debt level increases, the commitment of the government to pay back the debt is also increasing. Since the private sector is less productive due to the crowding-out effect problem, the government is expected to impose new taxes or increase the tax rate to accumulate more funds for debt financing. This, in return, leads to a slowdown of the economic growth as taxation creates a distortionary effect on the economy through a reduction in private consumptions and private investments.

4 Conclusion

In conclusion, the Reinhart-Rogoff hypothesis is still applicable to the UMIE but with a lower turning point. Instead of aiming at the ratio of public debt to GDP at 90 percent, the turning point for the UMIE is at 70 percent. In this case, the countries will experience a negative growth rate if they keep borrowing funds from the external sources. Out of 32 countries in the UMIE, only nine countries were expected to experience a negative relationship due to the debt level exceeding 70 percent of the turning point. These countries should take immediate measures to reduce the amount of funds borrowed from the external sources since the costs to pay back the debts might increase if the economies are facing currency depreciation and macroeconomic instability. It is to ensure that the countries in the UMIE are able to sustain higher economic growth and move out from the middle-income trap position. Or else, higher debt beyond 70 percent might result in an increase in the debt burden of the future generation, hence limiting the ability of the countries to achieve high-income nations even in the near future. In case if the governments still need additional funds for the economic growth and development, the priority of borrowing should be from the domestic side rather than the external ones. The debt derives from the domestic side does not incur any risk related to the fluctuation of the exchange rate. This work is different from others in two ways. Firstly, the findings are more robust since we removed the outliers. This step is often being neglected by previous researches, with a reason to capture all essential characteristics and components in the dataset. Nevertheless, ignoring the outliers may result in biased estimations. Secondly, this study contributes to the existing body of knowledge as we look at marginal effects at every point of the public debt by using the graphical form. This method is seldom being applied in the existing empirical researches. Future research might want to investigate how the institutional variables moderate the debt-growth relationship in the UMIE. Among the institutional variables include corruption, rule of law, and political stability. From the findings, the storylines behind the reasons why they are trapping in the middle-income trap position can be further exposed and explored.

References

[1] The World Bank Group, "World Bank country and lending groups," *The World Bank*, 2019. .

[2] A. Waheed, "Determinants of External Debt: A Panel Data Analysis for Oil and Gas Exporting and Importing Countries," *Int. J. Econ. Financ. Issues*, vol. 7, no. 1, pp. 234–240, 2017.

[3] D. W. Elmendorf and N. G. Mankiw, "Government debt," in *Handbook of Macroeconomics*, 1999, pp. 1615–1669.

[4] P. Krugman, "Financing vs forgiving a debt overhang," *J. Dev. Econ.*, vol. 29, no. 3, pp. 99–104, 1988.

[5] D. Y. Karadam, "An investigation of nonlinear effects of debt on growth," *J. Econ. Asymmetries*, vol. 18, pp. 1–13, 2018.

[6] N. Mhlaba and A. Phiri, "Is public debt harmful towards economic growth? New evidence from South Africa," *Cogent Econ. Financ.*, vol. 7, no. 1, pp. 1–15, 2019.

[7] V. Arčabić, J. Tica, J. Lee, and R. J. Sonora, "Public debt and economic growth conundrum: Nonlinearity and inter-temporal relationship," *Stud. Nonlinear Dyn. Econom.*, vol. 22, no. 1, pp. 1–20, 2018.

[8] M. Intartaglia, A. Antoniades, and S. Bhattacharyya, "Unbundled debt and economic growth in developed and developing economies: An empirical analysis," *World Econ.*, vol. 41, no. 12, pp. 3345–3358, 2018.

[9] C. M. Reinhart, V. R. Reinhart, and K. S. Rogoff, "Public debt overhangs: Advanced- economy episodes since 1800," *J. Econ. Perspect.*, vol. 26, no. 3, pp. 69–86, 2012.

[10] N. Bitar, A. Chakrabarti, and H. Zeaiter, "Were Reinhart and Rogoff right?," *Int. Rev. Econ. Financ.*, vol. 58, pp. 614–620, 2018.

[11] J. Mencinger, M. Verbic, and A. Aristovnik, "Revisiting the role of public debt in economic growth: The case of OECD countries," *Eng. Econ.*, vol. 26, no. 1, pp. 61–66, 2015.

[12] A. Chudik, K. Mohaddes, M. H. Pesaran, and M. Raissi, "Is there a debt-threshold effect on output growth?," *Rev. Econ. Stat.*, vol. 99, no. 1, pp. 135–150, 2017.

[13] M. Gomez-Puig and S. Sosvilla-Rivero, "Heterogeneity in the debt-growth nexus: Evidence from EMU countries," *Int. Rev. Econ. Financ.*, vol. 51, pp. 470–486, 2017.

[14] V. Sulikova, M. Djukic, V. Gazda, D. Horvath, and L. Kulhanek, "Asymmetric impact of public debt on economic growth in selected EU countries," *Ekon. Cas.*, vol. 63, no. 9, pp. 944–958, 2015.

[15] C. M. Reinhart and K. S. Rogoff, "Growth in a time of debt," *Am. Econ. Rev.*, vol. 100, no. 2, pp. 573–578, 2010.

[16] P. M. Romer, "Increasing returns and long-run growth," *J. Polit. Econ.*, vol. 94, no. 5, pp. 1002–1037, 1986.

[17] R. E. Lucas, "On the mechanics of economic development," *J. Monet. Econ.*, vol. 22, no. 1, pp. 3–42, 1988.

[18] S. G. Hall and M. Ahmad, "Revisiting the institutions–growth nexus in developing countries: The new evidence," *New Zeal. Econ. Pap.*, vol. 48, no. 3, pp. 301–312, 2014.

[19] E. Kim, Y. Ha, and S. Kim, "Public debt, corruption and sustainable economic growth," *Sustainability*, vol. 9, no. 3, p. 433, 2017.

[20] M. H. Ibrahim and S. H. Law, "Institutional quality and CO2 emission–trade relations: Evidence from Sub-Saharan Africa," *South African J. Econ.*, vol. 84, no. 2, pp. 323–340, 2016.

[21] J. B. Madsen, M. R. Islam, and H. Doucouliagos, "Inequality, financial development and economic growth in the OECD, 1870–2011," *Eur. Econ. Rev.*, vol. 101, pp. 605–624, 2018.

[22] M. Arellano and S. Bond, "Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations," *Rev. Econ. Stud.*, vol. 58, no. 2, pp. 277–297, 1991.

[23] U. Panizza and A. F. Presbitero, "Public debt and economic growth: Is there a causal effect?," *J. Macroecon.*, vol. 41, no. March, pp. 21–41, 2014.

[24] L. Hansen, "Large sample properties of generalized method of moments estimators," *Econometrica*, vol. 50, pp. 1029–54, 1982.

[25] D. Roodman, "A note on the theme of too many instruments," *Oxf. Bull. Econ. Stat.*, vol. 71, no. 1, 2009.

[26] E. N. Abdul Bahri, “Pelaburan langsung asing, pembangunan kewangan, kemeruapan kadar pertukaran asing dan pertumbuhan ekonomi,” Universiti Kebangsaan Malaysia, 2018.
[27] T. Brambor, W. R. Clark, and M. Golder, “Understanding interaction models: Improving empirical analyses,” *Polit. Anal.*, vol. 14, pp. 63–82, 2006.
[28] A. Afonso and Y. Ibraimo, “The macroeconomic effects of public debt: an empirical analysis of Mozambique,” *Appl. Econ.*, vol. 52, no. 2, pp. 212–226, 2020.