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NON-LINEAR IMPACT OF GLOBALISATION TO PUBLIC OUTLAYS IN MIDDLE INCOME COUNTRIES

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Abstract

The research objective of this research is to investigate the role of globalisation on government expenditure and government education expenditure in middle-income countries with a linear and non-linear approach. This study uses a sample of 66 countries for Middle-Income Countries (MIC) and 126 countries for The World. Data are from the IMF, World Bank, Konjunkturf orschungs stelle (KOFF), and other reliable sources, compiled annually from 1960 to 2024. These studies use simple panel dynamic regression using the System Generalised Method of Moments (GMM). This study also investigates the influence of government expenditure (GC_1) and government education expenditure (GCE_2), and the influence of other exogenous variables, such as GDP growth, unemployment, and age dependency. Furthermore, the robustness model is checked by other main control variables of globalisation. In globalisation main variables is globalisation index (KOFF_ALL) substitute with economic globalisation index (KOFF_ECGI), political globalisation index (KOFF_POGI), and social globalisation index (KOFF_SOGI). The study's results show a positive linear correlation exists between globalisation and government expenditure in MIC that follow compensation arguments (globalisation has positive correlation with government expenditure), while a positive cubic N-shape correlation of politic globalisation exist in The World relationship that follow efficiency and compensation arguments (globalisation exist mix impact of positive and negative correlation to government expenditure). Importance to policymakers to drive policy encourages globalisation, which creates excess fiscal expansionary capacity. But political globalisation creates a positive cubic relationship, so timing for fiscal execution is a must. Further studies are a must; these studies found weak evidence in the cubic model.

Keywords: Government expenditure, globalisation, efficiency and compensation, cubic relationships.

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Introduction

Globalisation is a pillar of the economy. Since mercantilism, Adam Smith's invisible hand, and knowledge and digital advantage indicate the importance of free trade and globalisation. Furthermore, government expenditure in the Keynesian, Neo-Keynesian, and New Keynesian models underscores the importance of government intervention as a fiscal tool for stabilizing an economy. The main issue is that there have been many studies on globalisation and economic growth, but few on globalisation and government expenditure. Furthermore, recent generalised studies have examined the relationship between globalisation and government expenditure in middle-income countries with a nonlinear or positive cubic model. This study examines the influence of government expenditure on economic development and growth, an indirect approach to determine the impact of globalisation on economic progress. But in a twist. This relationship shows a positive linear correlation in a linear model. However, this does not explain the positive cubic and nonlinear relationship that characterizes the middle-income trap in Middle-Income Countries (MICs). Major scholars such as Heimberger (2021) and Garrett (2001) explore this interplay between globalisation and government expenditure. Both authors contribute to

the relationship between globalisation and the economy. However, it does not deeply explore the importance of the indirect impact and the non-linearity of globalisation on government expenditure. Moreover, government expenditure on economic growth would enhance the non-linearity and prove the existence of a positive cubic or N-shape correlation. Both authors contribute to the relationship between globalisation and the economy. However, it does not deeply explore the importance of the indirect impact and the non-linearity of globalisation on government expenditure. Moreover, government expenditure on economic growth would strengthen the non-linearity and support a positive cubic or N-shaped correlation. Main scholars also chart the terrain with three primary hypotheses: the efficiency argument (globalisation creates a positive effect on government expenditure), the compensation argument (globalisation creates a positive effect on government expenditure), and a synthesis of both (globalisation creates a mix of positive and negative effects on government expenditure), which postulates a nuanced, N-shaped non-linear or positive cubic correlation between globalisation and government spending patterns. This research adopts this compounded view, arguing that globalisation affects government expenditure through efficiency gains and compensatory dynamics, thereby shaping a nation's ability to navigate the complexities of the middle-income trap. So, this further enhances human knowledge by highlighting the importance of globalisation to fiscal and economic growth, but this correlation also indicates non-linearity and explains why some countries are trapped in the middle-income trap, while others are not.

Figure 1 shows a negative correlation between trade globalisation and government expenditure in Upper Middle-Income (UMC). In 2008, trade stood at 58.47% and government expenditure at 14.77% of GDP. Nevertheless, in 2022, trade stood at 50.33% and government expenditure at 15.47% of GDP. The negative correlation between globalisation and government expenditure in UMC is vital evidence showing an N-shaped correlation in UMC. This similar trend in the relationship between government expenditure and human capital is not caused by institutional quality but is caused by compensation and efficiency ideas that cause this N-shaped short-run data trend, and this also indirectly shows the middle-income trap in UMC, even when government expenditure is the dependent variable. Furthermore, in the long run, there has been a positive correlation between globalisation and government expenditure.



Figure 1. Trade (% of GDP) on General Government Final Expenditure (% of GDP) in Upper Middle-Income Countries from 2008 to 2024.

Figure 2 shows a positive correlation between trade globalisation and government expenditure in Lower Middle-Income Countries (LMC). In 2015, trade stood at 43.08% and government expenditure at 10.09% of GDP. However, in 2022, trade stood at 49.59% and government expenditure at 11.42% of GDP. This data is complemented by Figure 1, indicating that globalisation and government expenditure exist in an N-shaped relationship in the short run, which is caused by efficiency and compensation. This efficiency and compensation indicate that the relationship between globalisation and government expenditure has both positive and negative correlations. Enhanced impact on becoming a middle-

income trap in UMC. Furthermore, in the long run, the relationship between globalisation and government expenditure is positive. Figures 1 and 2 clearly show that the relationship between globalisation and government expenditure exists in an N-shape, with LMC intending to have a positive relationship while UMC intends to have a negative correlation. This is evidence to support efficiency and compensation arguments, with efficiency negatively influencing UMC and compensation influencing LMC in a positive relation. This is because efficiency states that a negative correlation exists between globalisation and government expenditure, caused by more globalisation intent to reduce welfare. In comparison, compensation arguments exist, and there is a positive correlation between globalisation and government expenditure that institutions, culture, politics, democracy, fiscal decentralisation, and the domestic economy cause. Creating an N-shaped correlation between globalisation and government expenditure by compensation and efficiency causes a middle-income trap in UMC.

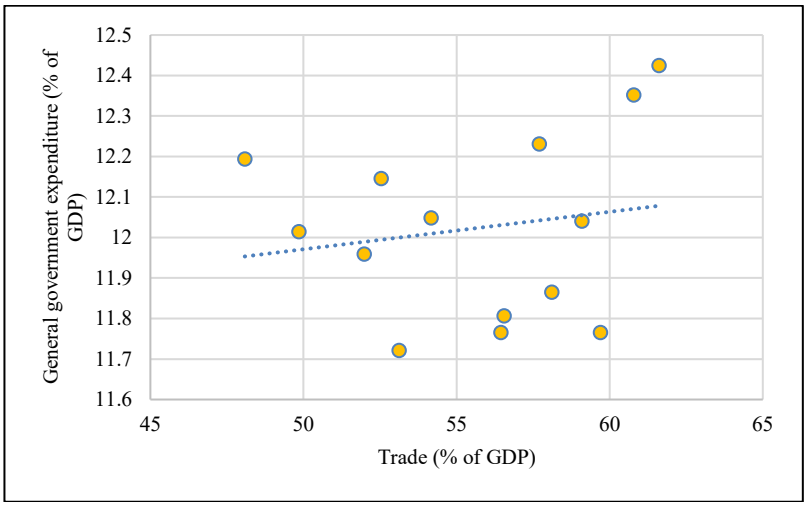


Figure 2. Trade (% of GDP) on General Government Final Expenditure (% of GDP) in Lower Middle-Income Countries from 2009 to 2024.

This argument created a clear research gap because there is a lack of studies on globalisation and government expenditure in MICs and The World, with an emphasis on nonlinearity within the efficiency and compensation in the globalisation school of thought.

This study aims to analyse the nexus between globalisation and government expenditure, with particular emphasis on government education expenditure. Specifically, the study first examines the linear relationship between globalisation and both government expenditure and government education expenditure in middle-income countries (MIC). Second, it investigates the positive N-shaped cubic nonlinear relationship between globalisation and these two expenditure variables at the global level. Finally, to assess the robustness of the empirical findings, the study substitutes the overall globalisation index (KOFF_ALL) with its three dimensions: economic globalisation (KOFF_ECGI), political globalisation (KOFF_POGI), and social globalisation (KOFF_SOGI). These alternative indices are examined in both linear and positive N-shaped cubic specifications for MIC and the global sample, covering their relationships with government expenditure and government education expenditure.

Major Literature

Major issues of globalisation are central to economic theory, from the foundations of economics itself. Starting with Smith (2018) & Ricardo (2022), the founders of globalisation and economic growth. It's split into two major disciplines: globalisation and government expenditure doctrine. First is capital mobility and government expenditure by Frankel (1962), Wood (1994), Quinn (1997), Rodrik (1998a, 1998b) and Garrett (2001) emphasize the importance of capital mobility and liberalisation, which essentially influence government expenditure. Second is regional globalisation and government expenditure by Charemza and Deadman (1997), Stanley and Doucouliagos (2012), and Gechert and

Rannenberg (2018), which focus on the influence of location and cluster regional liberalisation on government expenditure. This idea evolves from old-school trade liberalisation to government expenditure, and most recently from Jin et al. (2022). Furthermore, the first doctrine of capital mobility to government expenditure evolved into three major schools of globalisation to government expenditure.

First is the efficiency argument. This indicates that globalisation harms government expenditure. Sinn (1997), Streeck (2014), Alesina and Perroti (1997), and Schulze and Ursprung (1999) indicate that more globalisation creates more welfare, education, and standard of living while reducing government expenditure in economic development because the government focuses on operational expenditure. Second is the compensation argument with emphasis on the positive impact of globalisation on government expenditure by Rodrik (1998a, 1998b). Balassa (1967), Balassa (2013), and Porter (1985) support the orthodox and old school economic theorem. Both arguments, efficiency and compensation, are suitable in a linear model. Lastly efficiency and compensation argument believe that globalisation exist mix impact of positive and negative correlation to government expenditure by Navarro et al. (2004), Cusack (1997), Kim and Zurlo (2009), Garrett (2001), Kittel and Obinger (2003), Rodden (2003), Ha (2008), Razin et al. (1999), Kittel and Winner (2005), Brady et al. (2005), Busemeyer (2009), Epifani and Gancia (2009), Marshall and Fisher (2015), Franco et al. (2017), Heimberger (2021). Rehman et al. (2023) and Anderson and Obeng (2021) continue these studies on the non-linear, positive cubic relationship in MIC and explain the middle-income trap. Furthermore, regional globalisation also has a direct relationship and supports the compensation arguments.

Heimberger (2021) conducted a meta-analysis of recent studies about how globalisation affects government expenditure in meta-analysis. The authors focus on the previous literature nexus about globalisation and government expenditure in three ideas. First is the globalisation with efficiency argument. This argument states that when globalisation occurs, it will negatively impact the government with government expenditure because the government's intent to cut taxes and fiscal spending generates more globalisation Sinn (1997) and Streeck (2014). To support this argument, Alesina and Perotti (1997), globalisation creates more government expenditure on education but reduces social welfare. This idea is supported by Schulze and Ursprung (1999), who emphasise and support Alesina and Perotti's (1997) argument that government expenditure on education and infrastructure will increase to attract foreign investors in parallel with global market integration.

Second is globalisation with the compensation argument. This idea confirms that globalisation will increase government expenditures by increasing openness in financial sectors that attract foreign capital that fuels economic growth. This idea is supported by Rodrik (1998a, 1998b). This is an orthodox perspective that is equal to the classical school of thought that consists of Smith (1776), Ricardo (2022), Balassa (1967), Porter (1985), and Balassa (2013). Third is globalisation with efficiency and compensation arguments. This means there is scepticism about the unidirectional relationship of globalisation to government expenditure. This argument holds that other factors consist of a combination of efficiency and compensation arguments. This is supported by Navarro et al. (2004) (culture and institution), Cusack (1997), Kim and Zurlo (2009) (politic), Garrett (2001) and Kittel and Obinger (2003) (politic and democracy), Rodden (2003) and Ha (2008) (fiscal decentralisation), Razin et al. (1999) and Shelton (2008) (structure of population) and Stephens et al. (1999), Kittel and Winner (2005) (domestic economy). Continues the non-conclusive results of globalisation on government expenditure with Rodrik (1998a, 1998b), Kittel and Obinger (2003), Brady et al. (2005), Busemeyer (2009), Epifani and Gancia (2009), Marshall and Fisher (2015) and Franco et al. (2017). Heimberger (2021) also supports Gechert and Rannenberg (2018), Stanley and Doucouliagos (2012) and Charemza and Deadman (1997) that includes a dummy to avoid perfect multicollinearity and create a model that is less general but more specific model.

So, these studies embrace efficiency and compensation arguments with globalisation that influence government expenditure and institutional quality for MIC. More efficiency arguments exist in LMC, and compensation arguments exist in UMC. This study hypothesises that the compensation argument

creates a middle-income trap that coexists with the lack of innovation needed to break through to development.

Methods

These studies use panel data with the System Generalised Method of Moments (GMM) approach because of its simplicity, which is n larger than t, and because all sampling data suitable for this approach fit well with these generalisation studies. Furthermore, the GMM System is superior to GMM Different and GMM Basic because of the bias due to using an orthogonal condition. This studies also use two set of data with linear sample from 66 countries from MIC, which (n) also consists of 66 and 29-time series (t) from 1996 to 2024 that parallel the GMM condition of n >t in panel data, where optimisation t is around 10 – 30 and cubic with data sampling (n) consists of 126 and 29 time series (t) from 1996 to 2024 that parallel the GMM condition of n >t in panel data, enough to optimally t, a condition that around 8-30 that optimise the GMM. This condition is the most efficient and optimal condition for which the GMM system is chosen. This study also uses diagnostic tests such as AR2 that capture second-order autocorrelation problems, while the Hansen J-test measures the validity of the model. These studies use secondary data from The World Bank, the International Monetary Fund (IMF), and Konjunkturf orschungs stelle (KOFF). These studies have three models:

Specific model for Middle-Income Countries

$$GC_{1_{ct}} \text{ or } GCE_{2_{ct}} = \beta_0 + \beta_1 KOFF_{ct} + \beta_2 X_{ct} + \mu_{ct} + v_{ct}$$

General Model for cubic in The World

$$GC_{1_{it}} \text{ or } GCE_{2_{it}} = \beta_0 + \beta_1 KOFF_{\text{it}}^1 + \beta_2 KOFF_{\text{it}}^2 + \beta_3 KOFF_{\text{it}}^3 + \beta_4 X_{it} + \mu_{it} + v_{it}$$

Where: $\beta_1 > 0$, $\beta_2 < 0$, & $\beta_3 > 0$ for $KOFF_{it}$, for the general model. $GC_{1_{ct}}$, $GCE_{2_{ct}}$, $GC_{1_{it}}$ or $GCE_{2_{it}}$: GC_1 indicates government expenditure and GCE_2 is government education expenditure. These two variables are also coherent and parallel with objectives 1 & 2 as main variables. c for MIC country data, i for The World data, and t for time. $KOFF_{ct}$ or $KOFF_{it}$ is a globalisation index. First is KOFF_ALL is globalisation index, second is KOFF_ECGI is an economic globalisation index, third is KOFF_POGI is politic globalisation index and lastly KOFF_SOGI is a social globalisation index. There is also a cubic relationship. X_{ct} or X_{it} indicates other exogenous factors influencing government expenditure. GDP growth (positive). The relationship between government expenditure by Heimberger (2021), Yasmin and Sari (2024) and Hossain et al. (2024). Unemployment (negative) and age dependency (positive) are supported as determinants of government expenditure by Moridian et al. (2025) and Temsumrit (2023), respectively. A simple longitudinal data for regression consisting of an econometric model was estimated for trade to government spending model as shown in Equation 1.

$$\text{SPEND} = \alpha + \beta_1 EC + \beta_2 CM + \beta_k CONTROL + k_n REGION + \mu_{ct} \quad .....(1)$$

Equation 1 is adapted from Garrett (2001). This is an envelope theorem that is based on Frankel (1962) AK model in production function and growth, with further integration and globalisation arguments by Quinn (1997) and Rodrik (1998a, 1998b). Nevertheless, it aligns with Wood A. (1994), which indicates inequality and globalisation arguments. Equation 1 shows an augmented model based on Garrett (2001).

Equation 2 extends the framework of Malliaris and Brock (1982) and Branson and Henderson (1985), as subsequently developed by Erauskin and Turnovsky (2019) in their analysis of globalisation and government expenditure.

$$\text{K} + E_F\text{F} - E_D\text{D} = \text{W}, \text{ with } n_K + n_F - n_D = 1, \text{ W, G} = \theta \text{ C} \quad .....(2)$$

Where K, is Capital, E is equity, F is financial creditor, D is financial debtor, W is wealth, and C is consumption. Subject to this constraint, the wealth model evolves along the Balanced Growth Path (BGP), as expressed in Equation 3.

$$\frac{dW}{W} = \frac{dK}{K} = \frac{d(E_F F)}{E_F F} = \frac{d(E_D D)}{E_D D} = \psi\, dt + du_w \quad \text{.....(3)}$$

Where d is the margin, ψ is the mean growth rate, and du_w = Ω (L) $n_K du_Y + n_F du_F$ - $n_D du_{D,}$ with Y is income and L is labour supply. The basic government expenditure function is equation as shown in Equation 4.

$$\frac{G(t)}{Q(t)} = \theta \frac{C(t)}{W(t)} \frac{1}{n_K} \frac{1}{\Omega(L)} \quad \text{.....(4)}$$

Where (Q(t)= Ω (L)K(t), (Q(t)\) denotes output, G(t) represents government expenditure, C(t) is consumption, W(t) denotes wealth, L represents labour, K(t) denotes capital, θ is a parameter, and n_K represents the growth rate of capital. By taking the proportional differential of Equation (4), the relationship can be expressed as Equation 5.

$$\frac{d(G/Q)}{G/Q} = \frac{d(C/W)}{C/W} - \frac{dn_K}{n_K} \quad \text{.....(5)}$$

Where d is the margin of proportionate change, Equation 5 means that the proportionate change in government consumption is equal to the proportionate change in the consumption to wealth ratio, minus the portfolio share in equity. With the utility logarithmic function (C/W), γ=0, [β+w (L) n_K] $(1+\theta)^{-1}$ which accounts for the increase in portfolio share of capital (Equation 6):

$$\frac{d(\frac{G}{Q})}{G/Q} = \frac{w\,(L) Ln_K}{\beta + w\,(L) Ln_K} \frac{dn_K}{n_K} - \frac{dn_K}{n_K}, \; = - \frac{\beta}{\beta + w\,(L) Ln_K} \frac{dn_K}{n_K} \quad \text{……(6)}$$

With G/Q is government expenditure or the size of the government is accounted for by the direct impact of portfolio share, but inverse in portfolio share of capital. Additionally, with the assumption that n_K, n_F, n_D are positive, and the country is a creditor if $n_F > n_D$ and a debtor if $n_F < n_{D,}$ as the assumption holds in equation 2. Furthermore, with positive values of n_F and $n_{D,}$ the rates of return of r_K, r_F and r_D. This theoretical development is founded on globalisation on government expenditure arguments by Erauskin and Turnovsky (2019) with:

$$(\frac{G}{Q})_{it} = \alpha_0 + \alpha_{11} (\frac{IFI}{Q})_{it} + \alpha_{12} (\frac{IFI}{Q})^2_{it} + \alpha_{13}(\frac{NFA}{Q})_{it} + \alpha_{21}(\frac{GDP}{Pop})_{it} + \alpha_{22}(\frac{Trade}{Q})_{it} + \alpha_{23}\, Pop_{it} + \mu_{it} \quad \text{.....(7)}$$

Government expenditure based on International Financial Integration (IFI) and Net Foreign Asset Position (NFA) that measure countries' creditor and debtor positions. Q or output is introduced in the equation as an extension in equation 6. This continues to:

$$(\frac{G}{Q})_{it} = \alpha_0 + \alpha_{11} EGI_{it} + \alpha_{12}\, (EGI * \frac{NFA}{Q})_{it} + \alpha_2 GDPpc_{it} + \alpha_3 Size_{it} + \mu_{it} \quad \text{.....(8)}$$

The EGI is the economic globalisation index. Equations 1 to 6 indicate the essence in theoretical development of the relationship between globalisation and government expenditure. While equations 7 and 8 indicates latest globalisation on government expenditure studies by Erauskin and Turnovsky (2019) enlighten this study's hypothesis that this correlation exists in a quadratic correlation and a globalisation relationship without governance and institutional quality interference.

Result and Discussion

Tables 1 and 2 indicate the estimation results of the impact of the globalisation index (KOFF_ALL) on government expenditure (GC_1) and government education expenditure (GCE_2). This analysis also uses the GMM method because it optimizes efficiency, which is suitable for the panel data of this research, and the data also meet the conditions of the GMM method. Table 1 shows the linear relationship between globalisation and government education expenditure in Middle-Income Countries (MIC). Sample from 66 countries from MIC, which (n) also consists of 66 and 29-time series (t) from 1996 to 2024 that parallel the GMM condition of n >t in panel data, where optimisation t is around 10 – 30. While this output for GC_1indicates a one percentage point increase in the KOF Globalisation index (KOFF_ALL) is associated with a decrease of -0.144338 in GC_1. Other variables, with a 1 percentage point increase in GDP growth, unemployment, and age dependency, are associated with decreases of -0.7219. increase of +0.26635 and a decrease of -0.1159 in the government expenditure share of GDP (GC_1). The variables are significant but contradict the earlier hypothesis. Furthermore, output for GCE_2 indicates a one percentage point increase and one percentage point of KOFF_ALL, GDP growth, unemployment, and age dependency is associated with each decrease -0.0256, decrease of –0.1612, increase +0.0475, and decrease -0.0309 in government education expenditure in share of GDP (GCE_2). All models show that the partial instruments are valid and that there is second-order autocorrelation.

Furthermore, Table 1 shows consistency in sign and significance and holds the earlier hypothesis, but it lacks significance in the diagnostic tests of the J-test and AR2 test. Even though researchers use a lot of techniques such as collapsing instruments, lag selection, and re-specification, the problem is the data itself. For example, in model GC_1, the J-test is significant at 1% while AR2 is not significant. Furthermore, in model GCE_2, the J-test is not significant, while AR2 is significant at 5%.

Table 1. The Effect of Globalisation and Exogenous to Government Expenditure and Government Expenditure in Middle-Income Countries

Government Expenditure (GC1)		**Government Education Expenditure (GCE2)**	
	KOFF ALL		**KOFF ALL**
Constant	30.48314***	Constant	8.008822***
	(2.010012)		(0.714620)
KOFF_ALL	-0.144338***	KOFF_ALL	-0.025629***
	(0.020560)		(0.007479)
GDP GROWTH	-0.721986***	GDP GROWTH	-0.161297***
	(0.103920)		(0.035276)
UNEMPLOYMENT	0.266356***	UNEMPLOYMENT	0.047510***
	(0.023799)		(0.008969)
AGE DEPENDENCY	-0.115999***	AGE DEPENDENCY	-0.030972***
	(0.011962)		(0.004336)
AR(2) (p-value)	0.0000	AR(2) (p-value)	0.0697
J- test (p-value)	0.011640	J- test (p-value)	0.002150
No. of instruments	9	No. of instruments	9
Country	66	Country	66
No. of Observation	1914	No. of Observation	1914
Notes: upper is value of coefficient and parenthesis is standard error. ***,** and * denote 1%, 5% and 10% levels of significance, respectively.			

Table 2 shows the cubic relationship of globalisation to government education and expenditure in The World. Data sampling (n) consists of 126 and 29-time series (t) from 1996 to 2024 that parallel the GMM condition of n >t in panel data, enough to optimally t, a condition that around 8-30 that optimise the GMM. For GC_1 output, all KOFF_ALL variables are not significant, while other variables are significant. A one percentage point increase in GDP growth, unemployment, and age dependency is associated with a decrease of -0.432, an increase of +0.2706, and a decrease of -0.0258 in GC_1. While

for GCE_2, the output shows that a one-point increase $KOFF_ALL^1$ is associated with an increase of +0.5224 in GCE_2. Furthermore, the increase coefficient $KOFF_ALL^2$ and $KOFF_ALL^3$ will weaken and strengthen the nonlinear impact of GCE_2. This output also indicates the cubic relationship with $KOFF_ALL^1$ (positive), $KOFF_ALL^2$ (negative), and $KOFF_ALL^{3,}$ but lack of diagnostic test. While other variables are a one percentage point increase in GDP growth, unemployment, and age dependency is associated with each decrease -0.0445, increase +0.0445, and decrease -0.0102 in GCE_2. The model exhibits second-order autocorrelation, and at least one instrument is not valid. Same output for Table 1: researchers use many techniques such as collapsing instruments, lag selection, and re-specification, but the problem is the data itself. Both the J-test and AR2 diagnostic outputs indicate no significance for cubic. Simplified, Table 1 presents coefficient significance, signs, and consistency with the earlier hypothesis, while the diagnostic shows partial significance. Furthermore, Table 2 has the same properties of coefficient significance as Table 1, but the diagnostic is not significant.

This output shows that there exists a positive linear relationship between globalisation and government expenditure, while there is no strong evidence of a positive cubic relationship or N-shape correlation, as indicated by diagnostic testing, but the coefficient is significant.

Table 2. The Effect of Globalisation and Exogenous to Government Expenditure in The World with cubic relationship cases

Government Expenditure (GC1)		**Government Education Expenditure (GCE2)**	
Constant	18.25400***	Constant	-5.384261***
	(4.692626)		(1.771351)
KOF_ALL^1	-0.003906	KOF_ALL^1	0.522475***
	(0.254535)		(0.094597)
KOF_ALL^2	-0.003042	KOF_ALL^2	-0.008904***
	(0.004396)		(0.001616)
KOF_ALL^3	3.83E-05	KOF_ALL^3	5.02E-05***
	(2.43E-05)		(8.86E-06)
GDP GROWTH	-0.432189***	GDP GROWTH	-0.044561**
	(0.054852)		(0.018971)
UNEMPLOYMENT	0.270613***	UNEMPLOYMENT	0.044323***
	(0.017010)		(0.006157)
AGE DEPENDENCY	-0.025898***	AGE DEPENDENCY	-0.010238***
	(0.007496)		(0.002676)
AR(2) (p-value)	0.0000	AR(2) (p-value)	0.0003
J- test (p-value)	0.000023	J- test (p-value)	0.000451
No. of instruments	13	No. of instruments	13
Country	126	Country	126
No. of Observation	3654	No. of Observation	3654
Notes: upper is value of coefficient and parenthesis is standard error. ***,** and * denote 1%, 5% and 10% levels of significance, respectively.			

Robustness Check: Alternative Measure of Globalisation Index (KOFF_ALL)

Tables 3 and 4 indicate the estimation results of the impact of economic globalisation index (KOFF_ECGI), political globalisation index (KOFF_POGI), and social globalisation index (KOFF_SOGI) on government expenditure (GC_1) and government education expenditure (GCE_2). This analysis also uses the GMM method because it optimizes the efficiency that is suitable for the panel data of this research, and the data also meet the conditions of the GMM method. Table 3 shows the linear relationship of globalisation to government education and expenditure in Middle-Income Countries (MIC). Sample from 66 countries from MIC, which (n) also consists of 66 and 29-time series (t) from 1996 to 2024 that parallel the GMM condition of n >t in panel data, where optimisation t is around 10 – 30. Firstly, GC_1 output of KOFF_ECGI, a one-point increase and a one percentage point increase in KOFF_ECGI, GDP growth, unemployment, and age dependency each will be associated

with an increase of +0.023, a decrease of -0.407, an increase of +0.346, and a decrease of -0.0295 in GC_1 which is significant. In KOFF_ECGI, it is supported, whereas other variables contradict the earlier hypothesis. For KOFF_POGI, output a one-point increase and one percentage point is each associated with an increase in KOFF_POGI, GDP growth, unemployment, and age dependency will decrease by -0.088, decrease – 0.673, increase +0.234, and decrease -0.084 in GC_1, which is significant and contradicts the earlier hypothesis. Furthermore, in the KOFF_SOGI output, a one-point increase and a one percentage point increase in GDP growth, unemployment, and age dependency each is associated with a decrease of -0.522, an increase of +0.293, and a decrease of -0.063 in GC1, which is significant but contradicts the earlier hypothesis.

Secondly, GCE_2 of KOFF_ECGI output a one-point increase and one percentage point is each associated with an increase in KOFF_ECGI, GDP growth, unemployment, and age dependency, with increase +0.0097, decrease -0.1132, increase +0.065, and decrease -0.011 in GCE_2, which is significant, while KOFF_ECGI supports this, but other variables show contradict with the earlier hypothesis. Furthermore, in the KOFF_POGI output, a one-point increase and one percentage point are each associated with an increase in KOFF_POGI, GDP growth, unemployment, and age dependency, which will decrease by -0.0205 and decrease by -0.15. An increase + 0.0378 and decrease – 0.026 in GCE_2 that significance but contradict with earlier hypothesis. While in KOFF_SOGI output, a one-point increase and one percentage point each are associated with an increase in KOFF SOGI; GDP growth, unemployment, and age dependency will increase by +0.014, decrease by -0.105, increase by +0.051, and decrease by -0.013 in GCE_2, which is significant. KOFF_SOGI indicates support, while other variables contradict the earlier hypothesis. The model indicates that the majority of the data exhibit no second-order autocorrelation, and all instruments are valid. For example, for AR2, the value indicates that all the samples are significant except KOFF POGI and KOFF SOGI in GC_1. The J-test also shows strong results with significance for all except KOFF ECGI and KOFF SOGI in GCE_2. This testing indicates that MIC shows a significant linear positive correlation, proving that economic, political, and social globalisation will have a positive correlation with government expenditure, parallel with MIC output in Table 1.

Table 3. The Effect of Economic, Political and Social Globalisations and Exogenous to Government Expenditure and Government Expenditure in Middle-Income Countries

	Government Expenditure (GC1)				Government Education Expenditure (GCE2)		
	KOFF ECGI	**KOFF POGI**	**KOFF SOGI**		**KOFF ECGI**	**KOFF POGI**	**KOFF SOGI**
Constant	13.71990***	26.26385***	18.42935***	Constant	4.482678***	7.661053***	4.453303***
	(1.106803)	(1.082579)	(2.014280)		(0.420457)	(.392127)	(0.743243)
KOFF	0.023008**	-0.088498***	-0.005056	KOFF	0.009791**	-0.020597***	0.014625**
	(0.011629)	(0.008443)	(0.018989)		(0.004559)	(0.003169)	(0.007144)
GDP GROWTH	-0.407798***	-0.673689***	-0.522241***	GDP GROWTH	-0.113228***	-0.150531***	-0.105663***
	(0.081947)	(0.093088)	(0.106413)		(0.030293)	(0.032773)	(0.036926)
UNEMPLOYMENT	0.346071***	0.234080***	0.293142***	UNEMPLOYMENT	0.065075***	0.037828***	0.051705***
	(0.019863)	(0.023382)	(0.022568)		(0.008117)	(0.008984)	(0.008644)
AGE DEPENDENCY	-0.029590***	-0.084052***	-0.063141***	AGE DEPENDENCY	-0.011904***	-0.026327***	-0.013123***
	(0.008628)	(0.008966)	(0.013573)		(0.003414)	(0.003303)	(0.005046)
AR(2) (p-value)	0.2037	0.0000	0.0000	AR(2) (p-value)	0.0672	0.0337	0.0819
J- test (p-value)	0.169180	0.026126	0.227343	J- test (p-value)	0.000001	0.030143	0.000535
No. of instruments	9	9	9	No. of instruments	9	9	9
Country	66	66	66	Country	66	66	66
No. of Observation	1914	1914	1914	No. of Observation	1914	1914	1914

Notes: upper is value of coefficient and parenthesis is standard error. ***,** and * denote 1%, 5% and 10% levels of significance, respectively.

Table 4 shows the cubic relationship of globalisation to government education and expenditure in The World. Data sampling (n) consists of 126 and 29-time series (t) from 1996 to 2024 that parallel the GMM condition of n >t in panel data, enough to optimally t, a condition that is around 8-30, which optimize the GMM. First, the GC_1 output for KOFF_ECGI. A one-point increase and one percentage

point each is associated with an increase in KOFF_ECGI^2 and KOFF_ECGI^3, unemployment, and age dependency will increase of + 0.0071, decrease of -0.0000478, increase of +0.282, and increase of +0.0144 in GC_1, which is significant. Only age dependency is supported, while others are contradicted by earlier hypotheses. Furthermore, in ECGI_POGI output indicates one-point increase and one percentage point is each associated with an increase in KOFF_POGI^1, KOFF_POGI^2, KOFF_POGI^3, GDP per capita, unemployment and age dependency will increase +0.407, decrease -0.0096, increase +0.0000651, decrease -0.6009, increase +0.225 and decrease -0.036 on GC_1. All variables are significant, but only KOFF_POGI^1, KOFF_POGI^2, and KOFF_POGI^3 are supported, while other variables contradict the earlier hypothesis. Furthermore, this output also indicates a cubic relationship that supports KOFF_POGI^1(positive), KOFF_POGI^2 (negative), and KOFF_POGI^3 (positive). While in KOFF_SOGI output, a one-point increase and a one percentage point increase are associated with each in KOFF_SOGI^1, GDP per capita, unemployment, and age dependency: increase +0.2778, decrease -0.482, increase +0.246, and increase +0.02 on GC_1, which is significant. Only KOFF_SOGI^1 and age dependency are supported, while others are contradicted by earlier hypotheses.

Table 4. Economic, Political and Social Globalisation and Exogenous to Government Education Expenditure and Government Expenditure in The World with cubic

Economic Globalisation (ECGI)

	(GC1)	(GCE2)		(GC1)	(GCE2)
Constant	12.46035***	0.534883	UNEMPLOYMENT	0.282881***	0.044818***
	(2.778890)	(0.982032)		(0.016742)	(0.006051)
KOFF_ECGI^1	-0.220485	0.129706**	AGE DEPENDENCY	0.014448**	-0.002192
	(0.159409)	(0.056006)		(0.006481)	0.002297
KOFF_ECGI^2	0.007114**	-0.001229	AR(2) (p-value)	0.0286	0.1729
	(0.002892)	(0.001014)	J- test (p-value)	0.000004	0.002193
KOFF_ECGI^3	-4.78E-05***	3.35E-06	No. of instruments	13	13
	(1.66E-05)	(5.79E-06)	Country	126	126
GDP GROWTH	-0.542494	-0.071164***	No. of Observation	3654	3654
	(0.051422)	(0.017495)			

Politic Globalisation (POGI)

	(GC1)	(GCE2)		(GC1)	(GCE2)
Constant	13.08062***	3.779094***	UNEMPLOYMENT	0.225189***	0.035962***
	(1.399581)	(0.499005)		(0.018018)	(0.006428)
KOFF_POGI^1	0.407967***	0.109691***	AGE DEPENDENCY	-0.036658***	-0.016963***
	(0.083932)	(0.029932)		(0.005521)	(0.001931)
KOFF_POGI^2	-0.009666***	-0.002279***	AR(2) (p-value)	0.0000	0.0010
	(0.001533)	(0.000543)	J- test (p-value)	0.000000	0.105037
KOFF_POGI^3	6.51E-05***	1.43E-05***	No. of instruments	13	13
	(8.68E-06)	(3.06E-06)	Country	126	126
GDP GROWTH	-0.600939***	-0.065253***	No. of Observation	3654	3654
	(0.047319)	(0.016215)			

Social Globalisation (SOGI)

	(GC1)	(GCE2)		(GC1)	(GCE2)
Constant	5.104679*	-2.316708***	UNEMPLOYMENT	0.246091***	0.034507***
	(2.622237)	(0.894352)		(0.017926)	(0.006350)
KOFF_SOGI^1	0.277895*	0.258463***	AGE DEPENDENCY	0.020666**	0.008881***
	(0.158040)	(0.053095)		(0.009710)	(0.003396)
KOFF_SOGI^2	-0.003101	-0.003696***	AR(2) (p-value)	0.0000	0.0002
	(0.003011)	(0.001008)	J- test (p-value)	0.000002	0.006328
KOFF_SOGI^3	1.60E-05	1.88E-05***	No. of instruments	13	13
	(1.78E-05)	(5.96E-06)	Country	126	126
GDP GROWTH	-0.482971***	-0.041906*	No. of Observation	3654	3654
	(0.065236)	(0.021596)			

Notes: upper is value of coefficient and parenthesis is standard error. ***,** and * denote 1%, 5% and 10% levels of significance, respectively.

Secondly, GCE_2 of KOFF_ECGI output a one-point increase and one percentage point is each associated with an increase in KOFF_ECGI^1, GDP per capita, and unemployment increase +0.129, decrease -0.07, increase +0.04 on GCE_2, which is significant. But only KOFF_ECGI^1, is supported, while other variables contradict the earlier hypothesis. Furthermore, for KOFF_POGI output indicates one-point increase and

one percentage point is each associated with an increase in $KOFF_POGI^1$, $KOFF_POGI^2$,and $KOFF_POGI^3$, GDP per capita, unemployment and age dependency will increase + 0.109, decrease -0.0022, increase + 0.0000141, decrease -0.065, increase +0.035 and decrease -0.0169 on GCE_2 that significance. Only $KOFF_POGI^1$, $KOFF_POGI^2$, and $KOFF_POGI^3$ are supported, while other variables contradict the earlier hypothesis. This output also indicates a cubic relationship that supports $KOFF_POGI^1$ (positive), $KOFF_POGI^2$ (negative), and $KOFF_POGI^3$ (positive). Lastly, in KOFF_SOGI output, one-point increase and one percentage point is associated with each increase in $KOFF_SOGI^1$, $KOFF_SOGI^2$, $KOFF_SOGI^3$, GDP per capita, unemployment and age dependency increase +0.258, decrease -0.0036, increase +0.0000188, decrease -0.041, increase +0.034 and increase +0.0206 in GCE_2 that significance. But only $KOFF_SOGI^1$, $KOFF_SOGI^2$, $KOFF_SOGI^3$, and age dependency support, while other variables contradict the earlier hypothesis. This output also indicates a cubic relationship that supports $KOFF_SOGI^1$ (positive), $KOFF_SOGI^2$ (negative), and $KOFF_SOGI^3$ (positive). Diagnostic testing indicates that the model ECGI is significant at least at the 1% level in AR2, but not in the J-test. The second model of POGI indicates no significance in AR2 and partial significance in the J-test in GCE_2. Lastly, in SOGI, both AR2 and the J-test indicate no significance. Similar to Table 2, The World output also shows consistency in sign, coefficient, and the earlier hypothesis, but partial significance in diagnostic testing that impacts the GMM analysis.

The overall output indicates that there is significance in the coefficient and sign and supports the earlier hypothesis that globalisation will increase government expenditure in MIC and The World. In comparison, similar output is indicated in the cubic model, which proves the existence of a positive N-shaped relationship between globalisation and government expenditure. Nevertheless, the model has partial significance in diagnostic tests in AR2 and the J-test. For the main linear model, KOFF_ALL, ECGI POGI in GCE_2, and ECGI in GCE_1 indicate significance, while for the cubic model only ECGI in GCE_2 is significant in the diagnostic test. The linear model of KOFF_ALL in GCE_2 and KOFF POGI in GCE_2 indicate a negative correlation between globalisation and government expenditure. Other models, such as ECGI in GCE_1 and GCE_2, indicate a positive correlation between economic globalisation and government expenditure. Lastly, in the cubic relationship, only ECGI in GCE_2 passes the diagnostic test, with no strong significance in the coefficient. The other exogenous variables are significant but contradict the earlier hypothesis

The output indicates only the ECGI model is robust and significant. Means economic globalisation has a positive correlation with government expenditure in the linear MIC model. In the cubic model, there is little evidence that it exists. The majority of the cubic output indicates mixed sign results, while the majority is in a positive correlation. To conclude, we found strong evidence that MIC countries and The World react in a positive correlation between economic globalisation and government expenditure in linear form. This shows that to increase expansionary fiscal policy, it must liberalise the economic market. Second, there is a lack of evidence of a cubic relationship in The World sample. However, many have a positive cubic correlation; for example, $KOFF_POGI^1$, $KOFF_POGI^2$ and $KOFF_POGI^3$indicates increase at an increasing rate of impact of globalisation on government expenditure. This means globalisation has an impact in an exponential rather than an N-shaped manner. Third, all other exogenous variables indicate a contradiction to the earlier hypothesis. For example, GDP growth has a negative impact on government expenditure, meaning that when growth happens, the government will reduce government expenditure. This indicates that when a nation grows, policymakers will reduce and mitigate government expenditure, which shows the government will be cautious and save more when growth occurs. While unemployment has a positive correlation with government expenditure and contradicts the earlier hypothesis, it indicates that this occurs when unemployment occurs. The government will reduce expenditure when unemployment occurs, which shows the current pattern during economic downturns; policymakers will be spending more cautiously rather than making expansionary policies. Lastly, age dependency has a negative correlation with government expenditure, which also contradicts the earlier hypothesis. This is because when there is a greater population decline and more age dependency occurs, the government will reduce government expenditure, which shows a cautious policy. So, globalisation still influences government expenditure heavily for MIC and The World, but output is more exponentially evident in the cubic model. Other

exogenous variables indicate that there exists a more cautious relationship between government expenditure and GDP growth, unemployment and age dependency.

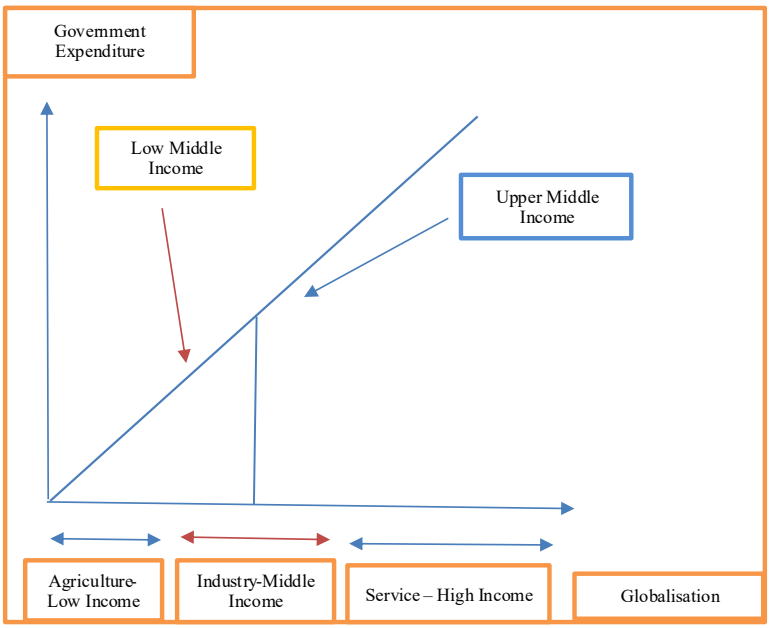


Figure 3. Linear relationship in Globalisation to Government Expenditure in Middle Income-Countries output frameworks

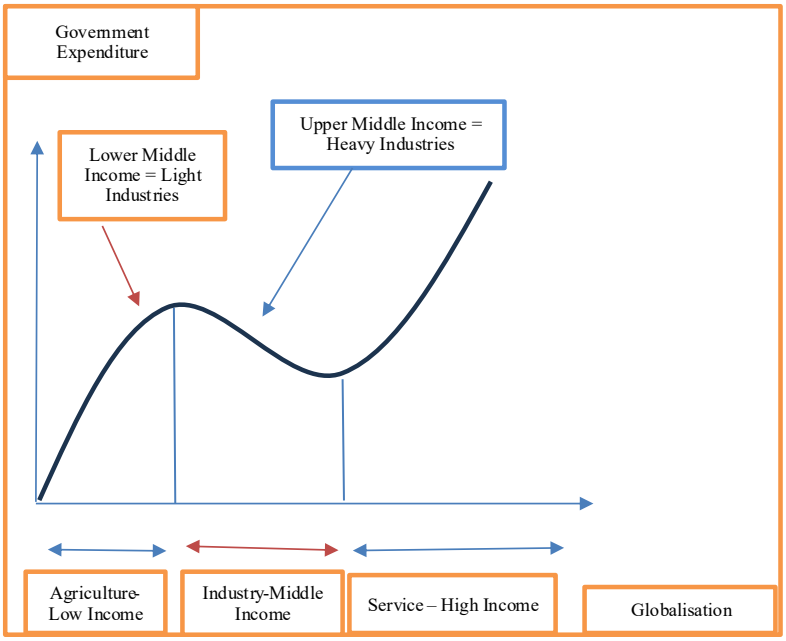


Figure 4. Positive cubic N-shaped relationship between Political Globalisation and Government Expenditure in The World output frameworks

Figure 3 represents the output for globalisation to government expenditure in MIC. Overall output suggested that exist positive relationship with more globalisation intent to have more government expenditure. This supports the compensation globalisation argument which suggests that globalisation have positive correlation with government expenditure, which supports Rodrik (1998a, 1998b). Balassa (1967), Balassa (2013) and Porter (1985). While Figure 4 presents the output of this research: globalisation and government expenditure in The World show a positive correlation in the long run but in short run the pattern indicates exist positive cubic N-shape correlation especially in political

globalisation. Furthermore, in Lower Income Countries (LIC) and Lower Middle-Income Countries (LMC), there is a positive correlation; in Upper Middle-Income Countries (UMC), a negative correlation; and in Higher Income Countries (HIC), a positive correlation again. This shows the continuity of the studies and the importance of policymakers, countries, and The World supporting the simple correlation that, in LICs and LMCs, Globalisation will increase government expenditure. But it will reach a turning point when nations become UMCs, because both correlations are inverse. This support the efficiency and compensation arguments which globalisation have mix impact of positive and negative correlation to government expenditure support by Navarro et al. (2004), Cusack (1997), Kim and Zurlo (2009), Garrett (2001), Kittel and Obinger (2003), Rodden (2003), Ha (2008), Razin et al. (1999), Kittel and Winner (2005), Brady et al. (2005), Busemeyer (2009), Epifani and Gancia (2009), Marshall and Fisher (2015), Franco et al. (2017), Heimberger (2021). Rehman et al. (2023) and Anderson and Obeng (2021).

Tables 5. Output Summary

Main Model					**Robustness Check**				
Globalisation (KOFF_ALL)	Linear		Cubic		Economic Globalisation (KOFF_ECGI)	Linear		Cubic	
	(GC^1)	(GCE^2)	(GC^1)	(GCE^2)		(GC^1)	(GCE^2)	(GC^1)	(GCE^2)
Constant	+ve (√)	+ve (√)	+ve (√)	-ve (x)	Constant	+ve (√)	+ve (√)	+ve (√)	-
$KOFF_ALL^1$	-ve (x)	-ve (x)	-ve (x)	+ve (√)	$KOFF_ECGI^1$	+ve (√)	+ve (√)	-ve (x)	+ve (√)
$KOFF_ALL^2$			-ve (√)	-ve (√)	$KOFF_ECGI^2$			+ve (x)	-
$KOFF_ALL^3$			+ve (x)	+ve (√)	$KOFF_ECGI^3$			-ve (x)	-
GDP GROWTH	-ve (x)	-ve (x)	-ve (x)	-ve (x)	GDP GROWTH	-ve (x)	-ve (x)	-ve (x)	-ve (x)
UEMPLOYMENT	+ve (x)	+ve (x)	+ve (x)	+ve (x)	UEMPLOYMENT	+ve (x)	+ve (x)	+ve (x)	+ve (x)
AGE DEPENDENCY	-ve (x)	-ve (x)	-ve (x)	-ve (x)	AGE DEPENDENCY	-ve (x)	-ve (x)	+ve (√)	-ve (x)
AR	(x)	(√)	(x)	(x)	AR	(√)	(√)	(√)	(√)
J-test	(√)	(√)	(x)	(x)	J-test	(√)	(√)	(x)	(√)
Robustness Check									
Politic Globalisation (KOFF_POGI)	Linear		Cubic		Social Globalisation (KOFF_SOGI)	Linear		Cubic	
	(GC^1)	(GCE^2)	(GC^1)	(GCE^2)		(GC^1)	(GCE^2)	(GC^1)	(GCE^2)
Constant	+ve (√)	+ve (√)	+ve (√)	+ve (√)	Constant	+ve (√)	+ve (√)	+ve (√)	-ve (x)
$KOFF_POGI^1$	-ve (x)	-ve (x)	+ve (√)	+ve (√)	$KOFF_SOGI^1$	-	+ve (√)	+ve (√)	+ve (√)
$KOFF_POGI^2$			-ve (√)	-ve (√)	$KOFF_SOGI^2$			-	-ve (√)
$KOFF_POGI^3$			+ve (√)	+ve (√)	$KOFF_SOGI^3$			-	+ve (√)
GDP GROWTH	-ve (x)	-ve (x)	-ve (x)	-ve (x)	GDP GROWTH	-ve (x)	-ve (x)	-ve (x)	-ve (x)
UEMPLOYMENT	+ve (x)	+ve (x)	+ve (x)	+ve (x)	UEMPLOYMENT	+ve (x)	+ve (x)	+ve (x)	+ve (x)
AGE DEPENDENCY	-ve (x)	-ve (x)	-ve (x)	-ve (x)	AGE DEPENDENCY	-ve (x)	-ve (x)	+ve (√)	+ve (√)
AR	(x)	(√)	(x)	(x)	AR	(x)	(√)	(x)	(x)
J-test	(√)	(√)	(x)	(√)	J-test	(√)	(x)	(x)	(x)

Table 5 represents the output summary relationship between globalisation and government expenditure. Exist positive linear for MIC and cubic or N-Shape political globalisation correlation of The World. The output clearly indicates support for the compensation argument, with the majority linear has positive correlation to government expenditure. While this study also finds weak evidence that exist efficiency and compensation argument. Only political globalisation that prove existence positive cubic with N-shape correlation, but the diagnostic is weak. This support continues studies by Heimberger (2021) and Garrett (2001).

Conclusion

The finding of this research underscores a complex interplay between globalisation and government expenditure across varying income categories, revealing both linear and non-linear relationship. Specifically, a positive linear relationship characterises the majority of the output within Middle Income Countries (MIC), reinforcing the compensation argument that globalisation positively influences government expenditure as nation transition from Lower Middle-Income (LMC) to Upper Middle-Income Countries (UMC). However, a positive cubic N-shape correlation illustrates a mixed impact on government expenditures at the global level, indicating that while political globalisation exhibits weak evidence of influencing efficiency and compensation, it also suggests the existence of a middle-income

trap in MIC nations. Furthermore, the study indicates that other exogenous variables, such as GDP growth and unemployment, introduce cautionary dynamics in government expenditure, demonstrating that economic conditions complicate responses to globalisation rather than conforming to traditional expenditure models. These collective findings support a nuanced understanding of globalisation; they must strategically navigate the dualities of its impact to enhance human capital and avoid stagnation. This highlights the necessity for policymakers to adopt informed approaches that leverage globalisation's potential while addressing the inherent challenges posed by their economic contexts. This research outlines a roadmap for MIC nations to overcome stagnation and achieved high income status by prioritising globalisation, education spending, and government expenditure. It emphasises that political globalisation influences government spending in a positive cubic relationship, indicating an N-shaped correlation, while MIC examples indicate the importance of economic, political, and social globalisation indicators on government expenditure and indirectly affect economic growth. This study supports the short-term and long-term importance of globalisation to government expenditure. Future studies are a must because the output suggests weak evidence of a cubic relationship, especially in political globalisation.

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Author Contribution

MA Abdul Majid – Conceptualization, methodology, investigation, resources, data curation, writing - original draft, writing - review & editing, visualization. NY Mohd Bani – final editing of the manuscript. NW Ismail – providing critical revisions to the manuscript. WAS Wan Ngah – the study's conceptualisation.

Conflict of interest

All the authors declare no conflict of interest in this article.

Declaration on the Use of Generative AI

The authors used Grammarly as a tool to assist with English language editing during manuscript preparation.

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