RE-EXPLORING THE NEXUS BETWEEN ECONOMIC FREEDOM AND GROWTH: IS THERE A THRESHOLD EFFECT?

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This study aims to assess the nonlinear effect of economic freedom on economic growth using a sample of 35 emerging and developing countries over the period 1996-2018. To this end, the threshold regression approach of Hansen (1999, 2000) has been deployed. The panel threshold analysis provides evidence of significant nonlinear relationship between economic freedom and economic growth. The tipping point of economic freedom is around 49.87 for the entire sample. Moreover, our findings prove that the estimated threshold level of economic freedom index in emerging countries (64.097) is significantly higher compared to that of developing countries (48.59). Looking at individual country results, the presence of nonlinear threshold effects of economic freedom on economic growth was confirmed in nineteen out of the thirty-five models. The estimated threshold values are quite heterogeneous, ranging from 35.16 in Zimbabwe to 75.87 in Chile.

1.   INTRODUCTION

The nexus between economic freedom and economic growth has received considerable interest in the theoretical and empirical literature over the past few decades. From a theoretical viewpoint, economic freedom should improve total factor productivity and capital accumulation and, thereby, enhance economic growth (Ayal and Karras, 1998; Moomaw and Yang, 2005). Economic freedom may also spur economic growth by increasing domestic investment (Gwartney et al., 2004; Justesen, 2008), improving the accumulation of human capital and lowering income inequality (Tavares and Wacziarg, 2001; Scully, 2002; Ashby and Sobel, 2008). Moreover, economic freedom may boost economic growth indirectly through foreign direct investment (FDI)

(Azman-Saini et al., 2010; Ajide and Eregha, 2014; Xu, 2018), trade openness (Depken and Sonora, 2005; Razmi and Refaei, 2013; Naanwaab and Diarrassouba, 2013; Bayar, 2016), and labor force (Cebula, 2011; Heller and Stephenson, 2014; Cebula, 2016; Bennet, 2016).

Empirical evidence on the significant role played by economic freedom in promoting economic growth is provided by several authors. In a pioneering study, Gwartney and Lawson (2002) observed that countries with high levels of economic freedom tend to achieve higher rates of economic growth. In a related study, Gwartney et al. (2004), based on a heterogeneous sample of 99 developed and developing countries for the period 1980-2000, found that economic freedom affects significantly and positively investment and economic growth. Similar evidence was provided by Justesen (2008), who used Granger causality tests and panel data analysis for the period 1970-1999. The author concluded that some aspects of economic freedom (government size and regulatory policies) enhance economic growth and domestic investment.

In a series of papers, Cebula and collaborators recently investigated the impact of economic freedom on economic growth in OECD nations for the period from 2002 to 2007 (Cebula, 2011, 2013; Cebula et al., 2013; Cebula and Clark, 2014; Cebula and Mixon, 2012, 2014). Their findings reveal a positive link between economic freedom and GDP level/ growth. Panahiet al. (2014) studied the impact of economic freedom on economic growth in some MENA countries for the period 2000-2009. They showed empirically that economic freedom had a positive and significant effect on economic growth. Applying variance analysis on a sample for 40 European countries, Asandului et al. (2016) found a positive relation between the index of economic freedom and GDP per capita. Moreover, based on panel data for 50 U.S states and 10 Canadian provinces over the 1980-2010 period, Bennet (2016) provided empirical evidence indicating that greater economic freedom enhanced income per capita and reduced unemployment rate. Using a panel data for 57 countries with different income levels for the period 2004-2014, Hussain and Haque (2016) examined the impact of economic freedom index on the annual growth rate of per capita GDP. They found little evidence in favor of a positive association between the investigated variables. More recent work by Miller and Kim (2017), Miller et al. (2018), Spruk and Kešeljević (2018), Murphy and O'Reilly (2019), Hall et al. (2019), Brkić et al. (2020), and Rapsikevicius et al. (2021) validated the positive relationship between economic freedom and economic growth.

Although a large number of empirical studies have examined this issue, a relatively fewer studies have focused on the specific case of emerging and developing countries. For instance, Gorlach and Le Roux (2015) analyzed the relationship between economic freedom and economic growth in 13 Southern African Development Community (SADC) countries and found that economic freedom was positively linked to GDP per capita. Wulandari (2015) examined the impact of economic freedom on Indonesia's growth rate over the 2004-2014 period. By using the vector autoregressive (VAR) model, the author showed a positive and statistically significant effect of economic freedom on the output growth rate. Byar (2016) applied the panel cointegration approach to assess the long-run

relationship between economic freedom and economic growth in 11 transitions countries over the period from 1996 to 2012. He also provided evidence for a positive long-run relationship between the two variables. The same growth-enhancing effect of economic freedom was found by Coetzee and Kleynhans (2017) for South Africa, by Tanin and Masih (2017) for Bangladesh, by Nadeem et al. (2019) for 5 South Asian countries, and by Okunlola and Akinlo (2021) for 44 African countries. In the case of Latin America and Caribbean countries, however, Santiago et al. (2020) found a negative association between economic freedom and economic growth.

All of the studies reviewed above which focused on both developing and developed countries, assumed that the relationship between economic freedom (or its components) and economic growth is strictly linear. However, as already emphasized by several scholars, the relationship might be nonlinear (see, for instance, Berggren, 2003; Ghosh et al., 2017; Zhang et al., 2018). In a number of earlier empirical studies, this type of non-linear behavior has been parsimoniously captured by including an interaction term between economic freedom index and some variables such as FDI (Azman-Saini et al., 2010), investment (Pääkkönen, 2010), GDP per capita (Gropper et al., 2011), state aid (Tunali and Fidrmuc, 2015), and corruption (Pavlik, 2018). Nevertheless, this modeling strategy has prior assumption that the effect of an interacted variable that increases or decreases monotonically with economic freedom and therefore may not detect a certain level of economic freedom that has to be attained. In this regard, employing an interaction term might be too restrictive to set up a non-monotonic and non-linear relationship between economic freedom and growth. Thus, a more flexible estimation strategy should be adopted for a more accurate detection of the possible non-linearities in the economic freedom -growth relationship.

In this paper, using a panel data of 35 emerging and developing countries over the period 1996-2018, we aim to examine whether there exist threshold effects of economic freedom on economic growth. In doing so, we address the following questions: when is economic freedom growth-enhancing? Is there a threshold effect of economic freedom on economic growth? If there is, what is the threshold level of economic freedom, beyond which it exerts a positive or negative effect on growth?

By addressing these questions, the study makes three main contributions to the literature. First, the threshold regression approach of Hansen (1999, 2000) employed in this research is novel to the literature on the economic freedom-growth nexus. This approach allows us to determine the threshold at which economic freedom is sufficient to enhance economic growth. The rationale for adopting this modeling strategy is that it captures the potentially contingency effects without imposing any specific nonlinear functional form. Furthermore, the number and position of thresholds are not predetermined, and they are both endogenously derived from the data. To the authors' best knowledge, this study is the first to employ Hansen's threshold model to examine the existence of contingency effects in the Economic Freedom-growth relationship. Second, instead of using heterogeneous cross-country sample, we estimate threshold level for each country, in order to verify the appropriateness of the common threshold

level across the 35 countries. Finally, most previous studies focus on the experience of developed economies, thus this study intends to fill this literature gap by considering a sample of emerging and developing countries.

The examination of nonlinearity in the economic freedom-growth nexus is motivated by both theoretical and empirical evidence, suggesting the presence of threshold effects in the impact of institutional variables on economic growth[1]. For instance, Méndez and Sepúlveda (2006) argued that the relationship between corruption and economic growth is nonlinear, non-monotonic and conditional on the degree of political freedom. They showed that corruption has a regime specific impact on long-run growth. Haque and Kneller (2009) and Aidt (2009) also demonstrated a similar non-linear relationship between corruption and economic growth, where a higher level of corruption tends to slow down economic growth. Furthermore, insight was offered by Alfada (2019) who concluded that the destructive effect of corruption increased if corruption levels exceed the threshold of 1.765 points. On the other hand, in a recent study, Hajamini and Falahi (2018) used a threshold model to better understand the non-linear relationship between economic growth and government size in 14 European countries over the 1995-2014 period. They concluded that government size become unproductive after passing an optimal threshold which differs among the 14 European countries. This confirmed the results obtained by Chen and Lee (2005). Using a dynamic panel threshold regression to study the importance of institutions in the finance-growth nexus, Slesman et al. (2019) concluded that asymmetric impact of institutions on growth is around the optimum threshold level. Viana et al. (2020) argued that democracy can reduce corruption only above a certain threshold of economic freedom.

For all the reasons discussed above, the relationship between economic freedom and growth is not expected to be monotonic. However, little attention has been aid to the (possible) presence of nonlinear threshold effects in this relationship. In this paper, we attempt to fill this gap by determining the economic freedom level from which economic growth can be improved. From a policy perspective, exploring the potential existence of threshold effects in the economic freedom-growth nexus is of paramount importance. If there is clear evidence that a lower level of economic freedom significantly impedes economic growth, or that a threshold level exists, then policymakers should formulate and implement sound policies in order to achieve the -benchmarking- score of economic freedom which has a growth-enhancing effect. In addition, knowing the tipping point in the relationship between economic freedom and growth is useful for policymakers, who should focus on other growth-enhancing policies if the appropriate economic freedom threshold has been reached.

The remainder of the paper is organized as follows. Section 2 presents the econometric methodology and data used in our analysis. Section 3 discusses the empirical results. Section 4 concludes.

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[1] For theoretical arguments see Aidt et al. (2008) and Dzhumashev (2014).

2.   ECONOMETRIC METHODOLOGY AND DATA

The focus of this section is to test the presence of the threshold effect (non-linearity) in the relationship between economic freedom index and economic growth. We empirically estimate the threshold levels of economic freedom index beyond which a negative (or positive) effect on economic growth is exerted. We use panel data covering a 23-year period from 1996 to 2018 and 35 emerging and developing countries.

The developments in growth theory and the availability of rich data sets have fostered considerable empirical analysis. Most respective studies have been conducted in the framework of the single cross-country regression suggested by Barro (1991). Briefly summarized, the approach consists in estimating the following equation:

$$\ln(y_{i.t}) - \ln(y_{i.t-1}) = \beta_0 - \beta_1 \ln(y_{i.0}) + \beta_1 \ln(y_{i.0}) - \beta_2 \ln(SK_{i.t}) + \beta_3 \ln(SH_{i.t})$$
$$+ \beta_4 \ln(X_{i.t}) + \varepsilon_{i,t}, \qquad (1)$$

where y is real income per capita, $y_{i.0}$ is initial GDP, SK is the rate of savings in physical capital, which is measured by the investment ratio (INV) and it is expected to have a positive impact on the growth rate, SH refers to the rate of saving in human capital and it is usually proxied by labor force (LABOR). In addition to these traditional growth determinants, we add the economic freedom index (EFI) in order to determine its threshold effect on economic growth. Accordingly, Equation (1) can be explicitly written as:

$$Growth_{it} = \alpha_{i0} + \alpha_1 GDPpc_{i0} + \alpha_2 \log Inv_{it} + \alpha_3 \log Labor_{it} + \alpha_4 \log EFI_{it} + \varepsilon_{it}, (2)$$

where $Growth$ denotes the growth rate of real per capita GDP. $GDPpc_{i0}$ is the initial level of per capita GD, (Inv) is the ratio of investment to GDP, $(Labor)$ is the labor force. All these variables are from world development indicators (WDI). As for the economic freedom index data, they are obtained from the Heritage Foundation[2]. According to the Heritage foundation (2019), the index of economic freedom (EFI) is an aggregate indicator based on 12 quantitative and qualitative components: property rights, judicial effectiveness, government integrity, tax burden, government spending, fiscal health, business freedom, labor freedom, monetary freedom, trade freedom, investment freedom, and financial freedom. These components are grouped into four categories: the rule of law, government size, regulatory efficiency and open markets. To create an overall score, the 12 components are aggregated using an arithmetic mean with equal weight. Scores are from 0 to 100. Higher scores imply that economy becomes freer, which creates new opportunity to economic growth. Thus, the lower the score, the

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[2] https://www.heritage.org/index/ranking.

greater the level of government intervention gets and economy the more repressed is the economy becomes (Heritage foundation, 2019). In our paper, we focus only on the overall score of the economic freedom index. A detailed description of the above variables and their source are provided in Table 1.

Table 1.   List of variables, description, and sources

Variables	Description	Sources
$Growth$	The growth rate of real per capita GDP	World Bank Development Indicators
$GDPpc_{i0}$	The initial level of per capita GDP	World Bank Development Indicators
Inv	Ratio of investment in fixed assets over GDP	World Bank Development Indicators
$Labor$	Labor force	World Bank Development Indicators
EFI	The economic freedom index is a combination of 12 component indices scaled from 0 to 100. These are property rights, government integrity, judicial effectiveness, government spending, tax burden, fiscal health, business freedom, labor freedom, monetary freedom, trade freedom, investment freedom, and financial freedom.	Heritage foundation

To examine the possible presence of nonlinear threshold effects in the relationship between economic freedom index and economic growth, we will use the bootstrap method proposed by Hansen (1999) in the case of panel analysis and a threshold model developed by Hansen (2000) in the case of univariate analysis. We start this section by a panel analysis. Hansen (1999) suggested a fixed-effect panel threshold model. This econometric model makes it possible to test the existence of threshold effects in the relationship between economic freedom and economic growth. This technique allows us to test the hypothesis that the equation can be divided into regimes depending on the value of threshold variables of economic freedom. If there is an existence of at least one threshold value, it implies that the relationship between economic freedom and economic growth is nonlinear. The presentation of the threshold regression models in this section is inspired by the work of Hansen (1999). The panel threshold model is defined as:

$$y_{it} = \mu_i + \beta'_1 x_{it}(q_{it} < \gamma) + \beta'_2 x_{it}(q_{it} \geq \gamma) + e_{it}, \tag{3}$$

where q_{it} is the threshold variable, and γ is the threshold parameter that divides the equation into two regimes with coefficients β_1 and β_2. The regressor x_{it} is a K vector. We can also write (3) as

$$y_{it} = \mu_i + \beta' x_{it}(\gamma) + e_{it}, \tag{4}$$

where $\beta = (\beta_1', \beta_2')$, and $x_{it}(\gamma) = \begin{pmatrix} x_{it}I(q_{it} < \gamma) \\ x_{it}I(q_{it} \geq \gamma) \end{pmatrix}$ and $I(\cdot)$ is the indicator function, which has the value one if the argument is true and zero if the argument is false.

By taking average of (4) over the time index t produces:

$$\bar{y}_i = \mu_i + \beta' \bar{x}_i(\gamma) + \bar{e}_i, \tag{5}$$

where $\bar{y}_i = \frac{1}{T}\sum_{t=1}^{T} y_{it}$ and similar notations apply to other variables. The difference between (4) and (5):

$$y_{it}^* = y_{it} - \bar{y}_i = \beta' x_{it}^*(\gamma) + e_{it}^*. \tag{6}$$

In order to determine the value of thresholds, least square is suggested by Hansen (1999).

$$\hat{\beta}(\gamma) = \left(X^*(\gamma)'X^*(\gamma)\right)^{-1} X^*(\gamma)'Y^*. \tag{7}$$

The vector of residuals is:

$$e^*(\gamma) = Y^* - X^*(\gamma)\hat{\beta}(\gamma),$$

and the sum of squared errors is:

$$S_1(\gamma) = e^*(\gamma)'e^*(\gamma). \tag{8}$$

The least squares estimator of γ is

$$\hat{\gamma} = argmin(S_1(\gamma)). \tag{9}$$

The threshold is the value that minimizes the residual sum of squared.

It is important to determine whether the threshold effect is statistically significant. The hypothesis is: $H_0: \beta_1 = \beta_2$ and $H_1: \beta_1 \neq \beta_2$.

Under the null hypothesis of no threshold, the model is:

$$y_{it} = \mu_i + \beta_1' x_{it} + e_{it}. \tag{10}$$

After the fixed-effect transformation is made, we have

$$y_{it}^* = \beta_1' x_{it}^* + e_{it}^*. \tag{11}$$

The sum of squared errors $S_0 = e^{*'}e^*$.

The likelihood ratio test of H_0 is:

$$F_1 = \frac{S_0 - S_1(\hat{\gamma})}{S_1(\hat{\gamma})/nT},$$ (12)

which has a nonstandard asymptotic distribution, and we rely on the bootstrapping procedure to determine the distribution.

3.   EMPIRICAL RESULTS

3.1.   Panel Analysis

Table 2 presents our panel threshold regression estimation results for the overall sample. The diagnostics tests prove that, for the autocorrelation test, we fail to reject the null hypothesis and we conclude that the data does not have first-order autocorrelation. Also, the cross-section dependence test proves that residuals are not correlated. Finally, the heteroscedasticity test shows that there is no heteroscedasticity in the residual data.

It can be clearly seen that the null hypothesis of no threshold can be rejected at least at the 1% significance level, indicating a significant presence of a nonlinear threshold effect of economic freedom on economic growth. Specifically, the point estimate of the threshold value is 49.87. Below this threshold value, economic freedom has a negative impact on growth. Once the economic freedom level attains the estimated threshold, its coefficient turns out to be positive and statistically significant. This is suggestive of a U-shaped relationship between economic freedom and economic growth in the full sample. This is the first study, to the best of our knowledge, to report such a non-monotonic relation between economic freedom and economic growth. These findings are complementary to those of Azman-Saini et al. (2010), Cebula et al. (2013), Bennet (2016), and Asandului et al. (2016) who concluded that economic freedom is crucial for economic growth. What is novel in this paper is that we find strong evidence that economic freedom has favorable impact on growth only when it reaches a certain threshold. It is also noteworthy, with regard to the magnitude of the coefficients, that the coefficient on EFI in the first regime is different from that in the second regime. This in turn suggests an asymmetric impact of economic freedom on growth. On the other hand, the results reveal that economic freedom is significant only in the high regime but not in the low regime.

Table 2. Economic Freedom's Impact on Economic Growth: Overall Sample

Threshold variable: **LEFI**		
Threshold estimate ($\hat{\tau}$)		
49.87*		
(0.001)		
	Lower Regime ($\leq \tau$)	Upper Regime ($> \tau$)
LEFI	-1.13	0.36*
	(-0.79)	(1.68)
LGDP	-0.34	1.3
	(-0.63)	(1.53)
LINV	-0.54**	0.96**
	(-4.31)	(3.7)
LLABOR	-0.43	0.23*
	(-1.03)	(1.66)
Constant	1.69	
	(0.15)	
95% confidence interval	[49.12; 50.02]	
Value of F-Statistic (P-value)	2.81***(0.00)	
Diagnostic test		
Autocorrelation test	0.206(0.6)	
Cross-sectional dependence test	1.23(0.21)	
Heteroskedasticity test	31.2(0.14)	

Notes: *, **, and *** indicate significance level at 10%, 5% and 1%, respectively.

Another important finding is that while they are not significant and/or negative in the first regime, the coefficients on investment and labor force are positive and significant in the second regime. This outcome is not a surprise, and in fact, is consistent with the findings of Azman-Saini et al. (2010) and Nejad and Young (2016) who have discovered that increases in economic freedom improve the mobility of labor and capital across countries. Economic freedom may also reduce transactions costs and affect positively the production frontier, and the technical efficiency (Klein and Luu, 2003; Zhang et al., 2018).

3.2. Robustness Checks

In order to test the robustness of our results and to assess the sensitivity of the results displayed in Table 2 to the choice of the sample of countries, we estimate the specification (2) separately for emerging and developing countries[3] as they might have heterogeneous threshold effects of economic freedom on economic growth. Leonardo and Angela (2021) showed that economic freedom worked as a moderator in the relationship between corruption and economic growth in the case of emerging countries

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[3] We thank an anonymous referee for suggesting the distinction between emerging and developing countries.

in Latin America and Pacific Asia, between 2000 and 2017. A greater economic freedom, on average, supports the growth of GDP per capita. Also, Yener and Scott (2016) examined the role of the economic freedoms such as regulatory efficiency, open markets and limited markets, political freedom and the rule of law in the growth of the global middle class through international business activity in 34 emerging markets during the period of 1994-2011. The analysis suggests that some dimensions of freedom are more critical than others in making these markets attractive locations for international business and this in turn leads to domestic growth and thus growth of the middle class in these countries. The results also reveal the existence of a feedback loop, whereby the growing middle class becomes a driving force for further expansion of international business activity and economic growth.

We therefore re-estimate Equations (12) on two separate sub-panels: one consisting of emerging countries, the other of developing countries. The corresponding results are reported in Table 3.

Table 3.   Economic Freedom's Impact on Economic Growth: Emerging vs. Developing

	Emerging countries		Developing countries	
	Threshold estimate ($\hat{\tau}$)		Threshold estimate ($\hat{\tau}$)	
	64.097* (0.07)		48.59***(0.00)	
	Lower Regime ($\leq \tau$)	Upper Regime ($> \tau$)	Lower Regime ($\leq \tau$)	Upper Regime ($> \tau$)
LEFI	-1.08(0.85)	0.35*(1.66)	-1.38(0.51)	0.81*(1.72)
LGDP	-0.46(-0.55)	-1.24(-1.29)	2.16*(1.73)	-0.18(-0.22)
LINV	3.57***(2.72)	1.81(0.8)	4.51(5.16)	2.33(3.31)
LLABOR	0.13(0.08)	0.66*(1.74)	-0.25(-0.23)	0.37*(1.67)
Constant	-16.17(-0.55)		0.34(0.02)	
95% confidence interval	[64 ; 64,2]		[48.29 ; 48.7]	
Value of F-Statistic (p-value)	2.01(0.03)		2.53(0.00)	
	Diagnostic test		Diagnostic test	
Autocorrelation test	0.312(0.52)		0.283(0.57)	
cross-sectional dependence test	1.43(0.18)		1.53(0.14)	
heteroskedasticity test	28.04(0.19)		30.42(0.15)	

Notes: *, **, and *** indicate significance level at 10%, 5% and 1%, respectively. *t*-statistics are presented in parentheses and p-values are in brackets.

Overall, the threshold effect of economic freedom on economic growth is significant in both sub-panels. Generally, the 95% confidences intervals ([64; 64,2] and [48.29; 48.7]) includes the threshold value (64.09 and 48.59) respectively. For emerging countries, the point estimate of the threshold value is 64.09. Below this threshold value, economic freedom has a negative impact on growth. Once the economic freedom level attains the estimated threshold, its coefficient turns out to be positive and statistically significant. Similarly, for developing countries, the threshold value is 48.59. With low level of economic freedom (below the threshold) the coefficients of this variable have a negative sign. In other word, with high level of economic freedom the coefficient of this variable should be positive, which confirms the U-shaped relationship between economic freedom and economic growth in both samples. These results confirm our findings for the overall sample supporting the nonlinearity of the relationship between economic freedom and economic growth. Furthermore, the asymmetric effect of economic freedom on economic growth is sustained by the fact that the coefficient EFI in the first regime is different from that in the second regime for the two groups of countries. In addition, and in conformity with results found for the overall sample, the coefficients of EFI are significant only in the upper regime for both emerging and developing countries.

Our findings also indicate that the estimated threshold level of economic freedom index in emerging countries (64.097) is significantly higher compared to that of developing countries (48.59). This finding is in line with that of Castro and Martins (2021) who found that the degree of economic freedom increased with the income level.

3.3.   Univariate Analysis

Next, we perform a univariate analysis using Hansen's (2000) threshold model to explore the potential existence of threshold effect in the economic freedom-growth nexus for each country in our sample. Through this approach, we can control any differences in the institutional and economic environment across countries. Results are reported in Table 4.

As can be seen, the presence of nonlinear threshold effects of economic freedom on economic growth is supported in nineteen out of the thirty-five models including seven emerging countries (Bulgaria, Chile, China, Pakistan, Philippines, Poland and South Africa) and twelve developing countries (Bolivia, Cameroon, Costa-Rica, Gabon, Georgia, Kenya, Nepal, Niger, Panama, Saudi Arabia, Sri Lanka and Zimbabwe).The estimated threshold values are quite heterogeneous, ranging from 35.16 in Zimbabwe to 75.87 in Chile. For these countries, the impact of the economic freedom index differs depending on whether it is below or above a specific threshold value.

Concerning the seven emerging countries and except of Pakistan, scores of economic freedom achieved in 2018 exceeded the estimated threshold, which implies that scores of economic freedom become growth-enhancing.

Table 4.   Economic Freedom Index and Hansen Threshold Effect Test

		Emerging countries Overall estimated threshold: 64.09		
Country	Score of EFI	Threshold	LM	p-value
Brazil	51.4	55.59	8.5	0.25
Bulgaria	68.3	57.05	10.27	0.1*
Chile	75.2	75.87	9.8	0.09*
China	57.8	51.42	10.34	0.10*
India	54.5	54.05	9.4	0.14
Pakistan	54.4	54.98	10.45	0.09*
Peru	68.7	64.72	8.7	0.3
Philippines	65.0	56.83	9.67	0.09*
Poland	68.5	59.15	9.97	0.07*
Romania	69.4	62.80	9.23	0.15
South Africa	63.0	62.80	10.24	0.08*
		Developing countries Overall estimated threshold: 48.59		
Country	Score of EFI	Threshold	LM	P-value
Algeria	44.7	54.05	9.57	0.14
Bolivia	44.1	57.97	10.51	0.03**
Cameroon	51.9	51.42	11.39	0.03**
Costa-Rica	65.6	66.69	9.23	0.08**
Egypt	53.4	54.05	9.17	0.24
Gabon	58.0	57.40	10.87	0.02**
Georgia	76.2	58.26	10.59	0.07*
Guatemala	63.4	62.80	8.33	0.287
Honduras	60.6	56.83	8.17	0.282
Iran	50.9	40.04	9.07	0.14
Kenya	54.7	57.97	11.33	0.02**
Nepal	54.1	51.39	10.44	0.1*
Nicaragua	58.9	58.56	8.7	0.2
Niger	49.5	48.42	11.87	0.01***
Nigeria	58.5	50.40	9.34	0.21
Oman	61.0	65.37	8.04	0.25
Panama	60.9	61.56	11.7	0.01***
Saudi Arabia	59.6	62.18	12.01	0.01***
Senegal	55.7	57.40	9.01	0.17
Sri Lanka	57.8	59.15	9.98	0.09*
Thailand	67.1	66.02	8.41	0.28
Tunisia	58.9	58.56	8.12	0.28
Uganda	62.0	60.34	8.28	0.25
Zimbabwe	44.0	35.16	9.83	0.09*

Notes: The score of EFI is collected from the Heritage foundation (2018).

However, it can be observed that emerging countries are in earlier stages in terms of promotion of economic freedom compared to developing countries. As showed in Table 4, among the twelve developing countries reflecting the threshold effect of economic freedom on economic growth, only six countries (Cameroon, Gabon, Georgia, Nepal, Niger, and Zimbabwe) achieved an economic freedom score that exceeded the estimated threshold. For the rest of countries, the score of economic freedom remained below the estimated threshold. Consequently, governments of these countries will need to invest more in economic freedom areas such as the effectiveness of judicial system, protection of property rights, government integrity and the eradication corruption.

On the other hand, the above heterogeneity in the threshold levels may suggest that there are important differences in the mechanisms through which economic freedom affects economic growth across countries. These mechanisms include foreign direct investment (FDI) (Azman-Saini et al., 2010; Ajide and Eregha, 2014; Xu, 2018), trade openness (Depken and Sonora, 2005; Razmi and Refaei, 2013; Naanwaab and Diarrassouba, 2013; Bayar, 2016), investment (Gwartney et al., 2004; Justesen, 2008; Imtiaz and Bashir, 2017), and labor force (Heller and Stephenson, 2014; Cebula, 2016; Bennet, 2016). Other factors, such as political freedom (Dawson, 1998, 2003; De Haan, Susanna and Sturm, 2006; Pitlik and Wirth, 2003; Lundstrom, 2005; Aixala and Fabro, 2009; Rode and Coll, 2012), natural resources and geography (O'Reilly and Murphy, 2017; Gohmann, 2018), and initial levels of income (Aixala and Fabro, 2009; Góes, 2016) may also determine the level of economic freedom and, in turn, impact the strength of the relationship between economic freedom and economic growth.

For the remaining models (Algeria, Brazil, Egypt, Guatemala, Honduras, India, Iran, Nicaragua, Nigeria, Oman, Peru, Romania, Senegal, Thailand, Tunisia, and Uganda), however, the evidence of nonlinearity appears to be weakened since the computed test statistics exceeded the 10% critical values, indicating that economic freedom variable has no threshold effect on economic growth. The level of economic freedom index for these countries was, generally, lower than the threshold level found for emerging (64.097) and developing countries (48.59). According to the Heritage foundation (2018), the economies of these countries are classified in most cases as mostly unfree economies (Egypt, Uganda, Nigeria, India, Brazil, Senegal, Nicaragua and Honduras) while other countries remain repressed economies (Algeria and Iran).

We now turn to results obtained for each of the 19 countries for which we found a significant threshold effect. These results are reported in Table 5. As can be seen, the U-shaped relationship between economic freedom and economic growth seems to be supported in the cases of Cameroon, Chile, China, Costa-Rica, Georgia, Nepal, Pakistan, Poland, and South Africa, where the economic freedom variable carries a negative coefficient in the first regime but a significantly positive coefficient in the second regime. However, such U-shaped relationship does not appear to be confirmed in the cases of Sri Lanka and Zimbabwe as economic freedom is significantly and positively related to economic growth in both regimes.

Table 5. Threshold Regression for Growth

		Threshold regression for growth: Emerging countries									
		Lower Regime ($\leq \tau$)					Upper Regime ($> \tau$)				
Country	Thre-	C	LEFI	LGDP	LINV	LLABOR	C	LEFI	LGDP	LINV	LLABOR
Bulgaria	57.05	0.99	0.43	-0.23**	-0.012	-0.04	14.3**	0.52*	0.036	0.26**	1.03**
		(0.19)	(1.11)	(-2.88)	(-0.60)	(-0.13)	(4.16)	(1.71)	(0.72)	(8.67)	(5.42)
Chile	75.87	6.6	-0.65	0.29	0.11*	-0.44	-3.86	0.77*	-0.125	-0.14	0.13*
		(1.20)	(-1.26)	(0.71)	(1.83)	(-0.88)	(-1.07)	(1.72)	(-0.78)	(-0.16)	(1.86)
China	51.42	-4.18	-0.47	-0.06	0.13*	0.3	-24.6**	0.3**	0.04**	0.23*	1.34**
		(-0.88)	(-1.42)	(-1.29)	(1.83)	(1.03)	(-2.56)	(3.4)	(4.44)	(1.69)	(2.68)
Pakistan	54.98	-2.05**	-0.68*	-0.66**	0.11	0.1	-0.71	0.33*	0.19*	0.41*	0.1**
		(-2.89)	(-1.89)	(-2.87)	(1.56)	(1.19)	(-0.49)	(1.67)	(1.86)	(1.75)	(2.11)
Philippines	56.83	-1.6	-0.27**	0.07	0.45**	0.04	12.4**	-0.19	0.95**	0.37**	-1.1*
		(-1.44)	(-4.50)	(1.00)	(4.50)	(0.50)	(7.36)	(-0.9)	(9.50)	(6.17)	(-1.67)
Poland	59.15	1.73	-0.41**	0.002	0.05*	-0.009	44.7**	0.4**	0.29**	0.3**	3.01**
		(0.43)	(-5.86)	(0.10)	(2.35)	(-0.04)	(5.09)	(3.58)	(7.25)	(4.29)	(5.10)
South Africa	62.8	1.84**	-0.12**	0.31**	-0.26**	-0.19**	3.21**	0.2**	0.67**	0.17**	-0.45*
		(5.11)	(-2.40)	(5.17)	(-6.34)	(-6.33)	(9.17)	(3.5)	(13.40)	(17.00)	(-1.69)
		Threshold regression for growth: Developing countries									
		Lower Regime ($\leq \tau$)					Upper Regime ($> \tau$)				
Country	Thre-	C	LEFI	LGDP	LINV	LLABOR	C	LEFI	LGDP	LINV	LLABOR
Bolivia	57.97	-2.3	0.006	-0.07	0.04**	0.18**	1.65*	0.19*	1.97**	0.16**	1.09**
		(-1.46)	(0.09)	(-1.40)	(2.00)	(2.00)	(2.29)	(1.68)	(2.81)	(2.67)	(3.41)
Cameroon	51.42	0.9**	-0.11**	0.64**	0.22**	-0.36**	2.31**	0.6**	0.82**	0.13**	-0.33**
		(7.32)	(-2.62)	(5.82)	(5.79)	(-6.32)	(3.16)	(3.2)	(5.90)	(3.25)	(-1.50)
Costa-Rica	66.69	9.13**	-2.25**	-0.11	-0.06	0.11	-0.14	0.06	0.03	0.08**	-0.04
		(2.92)	(-3.13)	(-0.73)	(-0.46)	(0.65)	(-0.17)	(0.30)	(0.75)	(2.00)	(-1.01)
Gabon	57.40	-14.6**	0.128	0.93	0.06*	0.14	-3.39	0.13*	0.23*	0.19*	0.28*
		(-4.56)	(0.29)	(1.63)	(1.72)	(1.42)	(-1.26)	(1.81)	(1.75)	(1.78)	(1.73)
Georgia	58.26	-47.3**	-0.83**	0.64*	0.09**	3.12**	-39.9**	0.2**	0.11**	0.09**	2.6**
		(-4.30)	(-4.38)	(1.82)	(2.8)	(3.52)	(-3.85)	(3.67)	(2.24)	(2.59)	(3.82)
Kenya	57.97	-2.16**	0.33	0.14*	0.03*	-0.01	3.09**	0.4**	0.18*	0.47**	0.39**
		(-2.10)	(1.14)	(1.75)	(1.70)	(-0.33)	(3.51)	(2.17)	(1.72)	(4.70)	(3.90)
Nepal	50.91	0.57	-0.76*	0.25**	0.008	0.31*	13.8**	0.1**	0.85**	0.05*	1.14**
		0.49	(-1.74)	(3.57)	(0.40)	(1.74)	(3.88)	(2.4)	(3.54)	(1.67)	(3.80)
Niger	48.42	-7.3**	0.23	0.98**	-0.06	-0.19*	5.16**	0.35*	1.12**	0.18**	0.76**
		(-4.80)	(1.20)	(2.01)	(-1.50)	(-1.90)	(4.87)	(1.9)	(7.47)	(9.1)	(6.33)
Panama	61.56	15.2**	0.29	0.8**	-0.09	-1.6**	-19.1**	2.5**	0.44**	0.04**	0.88**
		(6.58)	(1.12)	(2.33)	(-1.00)	(-2.71)	(-8.26)	(8.33)	(6.29)	(4.00)	(7.33)
Saudi Arabia	62.18	-4.23	-0.08	0.85**	-0.07	-0.22**	-8.9**	-0.6	1.15**	0.2**	0.06**
		(-1.45)	(-0.19)	(5.31)	(-0.88)	(-4.40)	(-11.13)	(-0.8)	(15.00)	(41.40)	(6.00)
Sri Lanka	59.15	-24.1**	0.81**	-0.12**	0.12	1.36**	-6.1**	0.4**	0.05*	-0.02	0.29**
		(-5.50)	(4.50)	(-3.00)	(1.20)	(4.86)	(-3.14)	(2.42)	(1.67)	(-0.67)	(2.42)
Zimbabwe	35.16	-17.5**	0.55*	-0.43**	-0.02**	-1.19**	12.1**	0.35*	0.66**	0.01	-0.48
		(-12.4)	(1.75)	(-3.91)	(-2.00)	(-11.9)	(3.25)	(1.83)	(3.30)	(0.53)	(-1.20)

In sum, it can be stated that except for Philippines (emerging country), Sri Lanka, Zimbabwe and Saudi Arabia, the results from the panel and country-by-country regressions provide strong evidence that economic freedom exerts a significant and positive effect on economic growth only when it has achieved a certain threshold level of economic freedom; below this threshold, the effect is negative or insignificant. To understand the reasons of the non-uniformity of the results between emerging versus developing countries as well as between countries of the whole sample, it is important to highlight the main channel of influence of economic freedom (Thuy, 2022). In other words, it is necessary to determine the contribution of all components of economic freedom in economic growth in order to compare government's efforts and determine areas of economic freedom which must be improved in each country.

4.   CONCLUSION

A large literature has investigated the relationship between economic freedom and economic growth, with scant attention, however, to the possible existence of nonlinearity or a threshold in this relationship. To fill this research gap, this study has examined the nonlinear effect of economic freedom on economic growth using a sample of 35 emerging and developing countries over the period 1996-2018. In other words, we have sought to examine whether or not there exists a threshold level of economic freedom from which economic growth can be improved. To this end, we have used the threshold regression approach developed by Hansen (1999, 2000) to test our hypothesis.

The empirical results indicate that there exist threshold effects in the economic freedom-growth nexus. Specifically, we have found evidence of a U-shaped relation between economic freedom and output growth. Below a critical level (49.87), economic freedom has a negative impact on growth. While the economic freedom index increases and goes beyond the estimated threshold value, the initial negative relation vanishes and the effect of economic freedom on economic growth becomes positive. This finding confirms to some extent the observation by Miller et al. (2018) that economic freedom has a highly significant effect on per capita GDP only for countries achieving moderate levels of economic freedom. Furthermore, our results tally with Santiago et al. (2020), who conclude that Latin America and Caribbean countries needs to reach a certain level of economic freedom in order to boost their economic growth.

In addition, our findings show that the estimated threshold level of economic freedom index in emerging countries (64.097) is significantly higher compared to that of developing countries (48.59). This result implies that emerging countries are in earlier stages in terms of promotion of economic freedom compared to developing countries.

The country-specific results also indicate that the effect of economic freedom on economic growth was not uniform across countries under consideration. The presence of nonlinear threshold effects was confirmed in nineteen out of the thirty-five models, i.e., Bolivia, Bulgaria, Cameroon, Chile, China Costa-Rica, Gabon, Georgia, Kenya, Nepal,

Niger, Pakistan, Panama, Philippines, Poland, Saudi Arabia, South Africa, Sri Lanka, and Zimbabwe. The estimated threshold values are quite heterogeneous ranging from 35.16 in Zimbabwe to 75.87 in Chile. Therefore, the study confirms that the homogeneity assumption in previous studies (for instance, Cebula et al., 2013; Hussain and Haque, 2016; Santiago et al., 2020), even for developing countries, can result in misleading findings while analyzing the link between economic freedom and economic growth.

Our findings do have some important policy implications for academics, as well as for policymakers. From an academic standpoint, the evidence presented here brings into question the implicit assumption that has been made in most previous empirical studies that the relationship between economic freedom and economic growth is linear. In this respect, our results may be very useful for future research, as they suggest that academics should account for nonlinearity when exploring the economic freedom-economic growth nexus.

From a policy viewpoint, our findings suggest that any (developing or emerging) country needs to reach a minimum level of economic freedom in order to enhance its economic growth. Thus, policy makers, especially in countries that have not attained the threshold level should improve economic freedom and thereby boost economic growth. The governments of this group of countries should pursue policy reforms in terms of judicial effectiveness, property rights and government integrity (Heritage Foundation, 2018). Incentives that limit the size of government and create greater economic dynamism in the private sector seems to be a real policy option, in particular for countries that have imposed a wide array of constraints on economic activity (Miller et al., 2018).

Despite the above-mentioned promising findings, it should be noted that our analysis has a number of limitations. First, given the lack of a theoretical framework on the threshold impact of economic freedom on economic growth, the results presented here need to be interpreted with caution. Yet, our results may be seen just as a first guideline for further fruitful analysis in this field. Hence, further substantive research is required to build more developed theoretical and analytical frameworks that would better accommodate the results reported in this study. Second, we recognize that in this paper we have interested to the nonlinearity of the relationship between economic growth and the overall freedom index. Considering that the freedom index is multidimensional, looking into other dimensions of freedom may be a useful extension in the field. In other words, determining the threshold level of each component of economic freedom and measuring its contribution in economic growth may be helpful to policymakers, mainly in developing countries, to understand the key areas of economic freedom that should be targeted in order to improve economic growth.

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