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Size-Threshold Effect in the Capital Structure–Firm Performance Nexus in the MENA Region: A Dynamic Panel Threshold Regression Model

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Abstract: This paper investigates the nonlinear relationship between capital structure and firm performance in the MENA region using a sample of 499 listed firms over the 2007–2020 period, or 6986 firm-year observations. Specifically, we examine the size-threshold effect in the capital structure–firm performance nexus. To do so, this study applies a dynamic panel threshold regression model (DPTR). The findings show that there is a nonlinear relationship between debt and firm performance (Tobin's Q, ROA, and ROE). Specifically, the threshold values of firm size for the three models are estimated at 9.126 (about $1 million), 15.48 (about $5 million), and 16.816 (about $20 million), respectively, between the low- and the high-sized regimes. In the lower regime, the firm's value (Q) increases when debt increases; however, in the higher regime, this value decreases when debt increases. Furthermore, in the lower regime, the performances (ROA and ROE) of small firms decrease when debt increases; however, in the upper regime, when debt increases, the performances of large firms increase. The results are several robustness tests. These results support the predictions of signal, pecking order, and trade-off theories. Managers of large (small) MENA firms should increase (decrease) the use of debt to improve performance.

Keywords: debt; firm performance; MENA region

Citation: Attia, Eman Fathi, Hamsa hany Ezz Eldeen, and Sameh said Daher. 2023. Size-Threshold Effect in the Capital Structure–Firm Performance Nexus in the MENA Region: A Dynamic Panel Threshold Regression Model. *Risks* 11: 23. https://doi.org/10.3390/risks11020023

Academic Editors: Ivana Mamić Sačer and Ivana Pavić

Received: 26 November 2022
Revised: 7 January 2023
Accepted: 12 January 2023
Published: 17 January 2023

1. Introduction

Capital structure is considered as being one of the main pillars of financial decisions. It increases investment opportunities, improves the firm's performance, and thus, ensures the firm's survival (Booth et al. 2001). The relationship between debt and firm performance has been a major theoretical and empirical debate (Khémiri and Noubbigh 2020).

From a theoretical viewpoint, this relationship has been widely discussed since the rejection of the Modigliani and Miller (1958) thesis. To more clearly explain this relationship, some theories have been developed: financial hierarchy theory, Myers and Majluf 1984, signal theory (Ross 1977), agency theory (Jensen and Meckling 1976), and trade-off theory (Bradley et al. 1984; Kim 1978; Kraus and Litzenberger 1973). Empirical studies show that there is no consensus on the nature of this relationship (Khémiri and Noubbigh 2020). Some studies have investigated the linear relationship (see, e.g., Majumdar and Chhibber 1999; Ramli et al. 2019; Zhang et al. 2017). However, other studies have shown a nonlinear relationship (see, e.g., Bae et al. 2017; Berger and Di Patti 2006; Khémiri and Noubbigh 2018). In addition, the size threshold effect on the debt–performance nexus has been a significant contribution to the recent literature (Jaisinghani and Kanjilal 2017; Khémiri and Noubbigh 2020; Le and Phan 2017).

Based on the previous literature, to the best of our knowledge, there is no previous study dedicated to the question of the relationship between debt and firm performance

in the Middle East and North Africa (MENA) region. Previous studies have focused only on the determinants of capital structure in this specific region (Awartani et al. 2016; Belkhir et al. 2016; Touil and Mamoghli 2020).

This paper makes several contributions to the current literature. First, we add to the ongoing debate on whether corporate financing decisions depend on firm performance. This is important for better understanding the research question, as the current literature is inconclusive. Second, we provide an empirical analysis in the context of the MENA region. This is an important contribution, as it is commonly accepted that the results obtained in the context of advanced countries may not be generalized to the MENA context. From an empirical viewpoint, the utilization of the Dynamic Panel Threshold Regression (DPTR) model could better explain the nonlinear relationship between debt and firm performance. This is important since most previous studies have used the static threshold model. To fill these research gaps, we examine the nonlinear relationship between debt and firm performance. Specifically, this paper examines the size threshold effect on the debt–performance nexus in the MENA region using the DPTR model (Seo and Shin 2016).

Based on the estimated threshold value, the sample of 10 countries in the MENA region (6986 firm-year observations) was divided into the low- and high-firm-size regimes to explain the effects of debt on small and large firms performances. This sample division allows us to explain the size threshold effect on the debt–firm performance nexus.

The study of the nonlinear relationship between debt and firm performance in the MENA region is important for several reasons. First, MENA firms face financing constraints because of the fragile legal framework that defines collateral regimes and creditor rights (Awartani et al. 2016). Second, most MENA countries suffer from low private investment rates and low access to finance, mainly long-term debt (Belkhir et al. 2016). Third, however, over the past two decades, these countries have undergone several changes to liberalize and develop their financial sectors (credit allocation, liberalization of stock markets, etc.).

The remainder of the paper is organized as follows. Section 2 provides a brief literature review. Section 3 outlines the data and the methodology. Section 4 presents and discusses the empirical results. Section 5 concludes the paper.

2. Literature Review

2.1. Theoretical Background

Since Modigliani and Miller's (1958) thesis, the study of the impact of capital structure on firm performance has been the subject of several theoretical studies. The first contribution is to consider the effect of corporate taxes on capital structure (Modigliani and Miller 1958). After this contribution, several theories have been developed. These theories can be grouped into two categories. The first category includes signal theory (Ross 1977) and pecking-order theory (Myers and Majluf 1984). The pecking order theory predicts the existence of a negative effect of leverage on firm performance. As for the signal theory, it provides a positive effect of leverage on firm value. Both theories agree on the presence of a linear relationship between debt and firm performance. The second category includes the theories of capital structure optimization, namely, agency theory (Jensen and Meckling 1976) and trade-off theory (Kim 1978; Kraus and Litzenberger 1973; Bradley et al. 1984). Both theories agree on the need to set an optimal debt ratio, below which firms gain certain advantages such as tax savings (Modigliani and Miller 1958). However, beyond this optimal level, these firms face certain costs (agency costs, debt costs, bankruptcy costs, etc.). They must be vigilant concerning certain risks that are likely to reduce their performances (Jensen and Meckling 1976; Kraus and Litzenberger 1973; Bradley et al. 1984). In this case, anchoring the capital structure is seen as an appropriate strategy, thus helping to maximize shareholder wealth.

2.2. Empirical Studies

According to the literature, the relationship between debt and firm performance has been the subject of much empirical study in different regions. The results of these studies are mixed. They differ according to the estimation method, the period, the firm's rating, the firm's specific characteristics (SMEs and large firms, age, etc.), and the country's specific characteristics (governance practices, economic growth, the development of financial markets, etc.).

In this framework, these empirical studies could be classified into three different groups. The first group comprises the empirical studies that found a linear relationship (positive or negative) between leverage and performance. Specifically, these empirical studies are grouped by region. Some studies have proven that leverage has a positive effect on the performances of US firms in the North American region (Berger and Di Patti 2006; Gill et al. 2011). Empirical studies on the Europe and Central Asia region are more numerous, compared to other regions. For example, Majumdar and Chhibber (1999) find that leverage (short-term debt and long-term debt) has a negative impact on firm performance in India. In addition, Vithessonthi and Tongurai (2015) examine the effect of debt on the financial performance of SMEs in Thailand. The main result shows that debt is an appropriate means of financing, thereby contributing to improved performance of Taiwanese firms. Likewise, Detthamrong et al. (2017) show the same results for the effect of debt on the performances of Thai listed firms during the 2001–2014 period. Similarly, Ramli et al. (2019) find a positive relationship between debt (measured according to short-term debt, long-term debt, and total debt) and firm performance during the period 1990–2010 for the Malaysian case. However, the authors find the opposite results in the case of Indonesia. They show that leverage exerts a negative effect on firm performance over a period from 1990 to 2010. In a study conducted on Chinese firms during 2007–2016, Zhang et al. (2017) show that debt also negatively affects firm performance (measured by ROA). Turning to the empirical studies conducted in this area for the case of Sub-Saharan Africa, they are similar to those found in the previous studies. Abor (2005) finds that debt (short-term and long-term debt) improves the financial profitability (ROE) of Ghanaian firms during 1998–2002. The MENA region, by comparison, seems to be the least exploited in the literature. Based on the debt–firm performance relationship, we find that there is only one study performed for the Jordanian case. In this study, Zeitun and Tian (2014) show that debt negatively affects Jordanian firms' performances (ROA and Tobin's Q).

The second group includes empirical studies that have shown a nonlinear relationship between leverage and firm performance. In addition, they must be classified by region. For the case of the North American region, we find that some authors show the existence of a nonlinear relationship between debt and firm performance, regardless of the measures opted for by the authors to measure debt or performance (see, e.g., Berger and Di Patti 2006; Bae et al. 2017 for the case of USA). This finding corroborates the one obtained by Margaritis and Psillaki (2010) for the case of the Europe and Central Asia region (particularly in France). The existence of a relationship between debt and firm performance has been confirmed in other empirical studies, both for the East Asia and Pacific regions (see e.g., Dalci (2018) for the case of China, and Akhtar et al. (2021) for the case of Pakistan) and for Sub-Saharan Africa (see, e.g., Khémiri and Noubbigh 2018 for the case of Sub-Saharan Africa).

The third group presents the empirical studies related to the threshold effect on the leverage–performance nexus. Referring to the previous literature, we find that empirical studies based on threshold models are limited to a few regions. Specifically, there are a few empirical studies that have been conducted on a few countries belonging to the East Asia and Pacific region. As an example, in a study conducted on 196 Taiwanese firms over a period from 1993 to 2005, Lin and Chang (2011) show that there is a non-linear relationship between debt and performance. More precisely, the debt threshold is estimated at 33.33%, below which Taiwanese firms must use more debt to improve their performance. In the same vein, Le and Phan (2017) thus prove a nonlinear relationship between debt and Vietnamese firms' performances. However, the major drawback of these

studies is that they are amply focused on using debt as a transmission variable. Similarly, Jaisinghani and Kanjilal (2017) show that capital structure positively (and negatively) affects Indian firms' performances. They attribute this effect to the size threshold effect on the debt–performance nexus. Turning now to the empirical studies performed for the Sub-Saharan African region, they appear to be important. For example, the results obtained by Matemilola et al. (2016) suggest a nonlinear relationship between debt and firm performance in South Africa. They offer support for the predictions of the trade-off theory. Using firm size as a transaction variable, Ibhagui and Olokoyo (2018) show that the relationship between capital structure and Nigerian firms' performance depends on firm size. As the firm size increases (large firms), the relationship between debt and performance will be positive, and vice versa. This confirms the predictions of agency and signal theories. Finally, the nonlinear relationship between debt and firm performance has also been confirmed by Khémiri and Noubbigh (2020) in five sub-Saharan countries. Their main result shows that firm size has a threshold effect on the debt–firm performance nexus. Their findings lead to the acceptance of the pecking order, trade-off, and signal theories. Based on this literature review, our main hypothesis is the following:

Hypothesis 1. *There is a threshold effect of firm size on the debt–firm performance nexus.*

3. Research Design

3.1. Sample and Data Collection

In this paper, data were collected from several sources for the sample period of 2007–2020, including Refinitiv DataStream, and the World Bank World Development Indicators (WDI) database. The Refinitiv DataStream is an industry-leading analytical data source that enables detailed exploration of links between data series. It contains financial data from almost 30,000 companies in more than 180 countries, especially more than 700 companies from the MENA region. The WDI database is the World Bank's best compilation of cross-country, such as data on development. We applied several sample selection criteria to construct a balanced panel. The choice of a balanced panel depends essentially on the estimation techniques used: dynamic panel threshold regression model. First, financial firms were excluded because of their different corporate structures and strategies. Second, the data screening included the analysis of missing data. For this purpose, we excluded firms that did not have data for at least five consecutive years. Third, data screening also included the determination of outliers. After eliminating these values, the dataset consisted of 499 firms from 10 MENA countries (Bahrain, Egypt, Jordan, Kuwait, Morocco, Oman, Qatar, Saudi Arabia, Tunisia, and United Arab Emirates (UAE)), covering the period 2007–2020. Table 1 represents the distribution of firms by country.

Table 1. Firms' distributions by country and industry.

Country	Number of Firms	Observations	% Observations
Bahrain	19	266	3.86%
Egypt	92	1288	18.45%
Jordan	84	1170	16.75%
Kuwait	70	980	14.03%
Morocco	40	560	8.02%
Oman	40	560	8.02%
Qatar	20	280	4.02%
Saudi Arabia	75	1050	15.03%
Tunisia	27	378	5.41%
UAE	32	448	6.41%
Total	499	6986	100%

3.2. Research Model and Variable Measurement

The main objective of our study is to analyze the nonlinear relationship between debt and firm performance. Specifically, we examine the threshold effect of firm size on the debt–performance nexus. To do so, we apply the DPTR model proposed by Seo and Shin (2016). The DPTR model is employed to estimate the firm size threshold value. In addition, it can better address potential endogeneity (Seo and Shin 2016). The empirical DPTR model equation is then written as follows:

$$\begin{aligned} Performance_{it} = & \begin{pmatrix} \beta_1 Performance_{t-1} + \beta_2 Debt_{it} + \beta_3 LIQ_{it} \\ +\beta_4 TANG_{it} + \beta_5 Tax_{it} + \beta_6 INF_{it} + \beta_7 GDP_{it} \end{pmatrix} 1\{q_{it} \le \gamma\} \\ & \begin{pmatrix} \lambda_1 Performance_{t-1} + \lambda_2 Debt_{it} + \lambda_3 LIQ_{it} \\ \lambda_4 TANG_{it} + \lambda_5 Tax_{it} + \lambda_6 INF_{it} + \lambda_7 GDP_{it} \end{pmatrix} 1\{q_{it} > \gamma\} + \varepsilon_{it} \end{aligned} \quad (1)$$

where $Performance_{it}$ is the dependent variable. Debt is the time-varying regressor; LIQ, TANG, Tax, INF, and GDP are the control variables; $1\{\cdot\}$ is an indicator function; and q_{it} is the threshold variable (firm size). γ represents the threshold parameter. $\varepsilon_{it}(\varepsilon_{it} = \mu_i + \nu_{it})$ consists of the error components, where μ_i are the individual fixed effects and ν_i is the idiosyncratic random disturbance. β and λ represent the coefficients of all independent variables for the lower and upper regimes, respectively. For specific model details, please refer to Seo and Shin (2016). Table 2 contains the description of all the variables employed in this study.

Table 2. Variable descriptions.

Variables	Acronyms	Definition	Sources
Tobin's Q	Q	The ratio of market capitalization, plus the book value of long-term debt, divided by the book value of a total asset	Refinitiv Eikon DataStream
Returns on assets	ROA	The ratio of earnings after interest and tax, divided by total assets	Refinitiv Eikon DataStream
Returns on equity	ROE	The ratio of earnings after interest and tax, divided by total equity	Refinitiv Eikon DataStream
Debt	Debt	The ratio of total debt, divided by total assets	Refinitiv Eikon DataStream
Firm size	Size	Natural logarithm of total assets	Refinitiv Eikon DataStream
Liquidity	LIQ	The ratio of current assets to current liabilities	Refinitiv Eikon DataStream
Asset tangibility	TANG	The ratio of tangible assets divided by total assets	Refinitiv Eikon DataStream
Non-debt Tax shields	Tax	The ratio of depreciation and amortization to total assets	Refinitiv Eikon DataStream
Inflation	INF	Consumer prices index	World Bank WDI
GDP growth	GDPG	GDP growth rate	World Bank WDI

In this context, we employed Tobin's Q (Q), returns on assets (ROA), and returns on equity (ROE) to measure firm performance. The first indicator is used to measure the firm value (Khémiri and Noubbigh 2020). Additionally, the two latest indicators were used to measure the firm profitability (Khémiri and Noubbigh 2020). In addition, we used the ratio of the total debt divided by the total assets to measure the firm debt (Debt).

To further refine the analysis, we have introduced a wide variety of control variables. To control the firm's ability to grant collaterals, we applied the size, which is measured by the natural logarithm of the total assets (Size). To control the level of liquidity, we used the ratio of the current assets to current liabilities (LIQ). Firms with high liquidity are required to utilize their funds instead of employing external financing. To control the collaterals, we applied the ratio of tangible assets divided by total assets (TANG). Indeed, the greater the share of tangible assets implies the further that the creditors are helped to grant loans to companies. To control the tax shield, we employed the ratio of depreciation and amortization to total assets (Tax). Indeed, firms with large amounts of non-debt-tax shields must reduce their access to external financing. In addition, we used the inflation rate to control the instability of the economic environment. Finally, we utilized the GDP growth rate (GDPG) to control the economic conditions of the country.

4. Results and Discussion

4.1. Descriptive Statistics

Table 3 summarizes the descriptive statistics of all variables used in this study. The mean values of firm performance measured by Q, ROA, and ROE are 1.084, 0.050, and 0.066, respectively. However, these values are still insufficient, compared to other regions. For example, the mean values of Sub-Saharan Africa firm performance are equivalent to 2.755, 0.745, and 0.842, respectively (Khémiri and Noubbigh 2020). Certainly, these values are higher compared to the MENA region. This suggests that the listed firms operating in the MENA region are underperforming, compared to those in Sub-Saharan Africa. Moreover, the average leverage value that is equal to 0.178 seems to be lower, compared to the one found by Khémiri and Noubbigh (2020) (equivalent to found 1.747). According to this first observation, MENA firms' access to credit remains too limited. These firms face external financing constraints (especially debt), which result in the deterioration of their profitability. In addition, the average value of the firm size is estimated at 12.517, reflecting the ability of large firms to perform well. Similarly, the mean values of the control variables are positive, except for GDPG, during the period 2007–2020. Based on this first observation, it is important to explain this finding through an econometric model.

Table 3. Descriptive statistics.

Variable	Obs.	Mean	Std. Dev.	Min	Max
Tobin's Q	6986	1.084	1.158	0	9.953
ROA	6986	0.05	0.093	−0.64	0.737
ROE	6986	0.066	0.179	−0.987	0.958
Debt	6986	0.178	0.184	0	0.928
Size	6986	12.517	2.495	4.111	20.001
LIQ	6986	0.379	0.271	0	0.955
TANG	6986	0.316	0.26	0	0.952
Tax	6986	0.033	0.04	0	0.88
Inflation	6986	0.047	0.052	−0.049	0.295
GDPG	6986	−0.004	0.037	−0.152	0.067

Notes: The table reports descriptive statistics of all variables used in this study for the period 2007–2020.

Table 4 summarizes the results of Pearson's correlation test. The finding shows that none of the correlations, among the independent variables, are higher than 0.5, indicating the absence of a multicollinearity problem.

Table 4. Correlation coefficients.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1) Q	1.000									
(2) ROA	0.233 *	1.000								
(3) ROE	0.222 *	0.750 *	1.000							
(4) Debt	0.021	−0.004	−0.027 *	1.000						
(5) Size	−0.037 *	−0.083 *	−0.065 *	0.364 *	1.000					
(6) LIQ	0.083 *	0.139 *	0.119 *	0.018	−0.013	1.000				
(7) Tang	0.029 *	−0.079 *	−0.061 *	0.002	0.089 *	−0.172 *	1.000			
(8) Tax	0.092 *	0.013	0.003	−0.035 *	0.004	−0.020	0.119 *	1.000		
(9) INF	0.035 *	−0.020	−0.014	−0.024 *	0.100 *	0.002	−0.003	−0.008	1.000	
(10) GDPG	0.009	0.000	0.021	−0.033 *	0.151 *	0.015	0.007	−0.015	0.273 *	1.000

Notes: This table reports the correlations among different variables for non-financial firms listed in the MENA region covering the period 2007–2020. * Correlation is significant at the 5% level.

4.2. Results of the Dynamic Panel Threshold Regression Model

In this study, the DPTR model is applied to examine the size threshold effect on the debt–performance nexus. Table 5 reports the results obtained for the three models associated with the different performance measures (Tobin's Q, ROA, and ROE). Using firm size (Size) as a transition variable, the threshold values of the three models are estimated at 9.126, 15.48, and 16.816, respectively. In addition, they pass the bootstrap linearity test at the 1% significance level, confirming the nonlinear relationship between debt and firm performance, and a threshold effect of firm size. This is detected through the *p*-value, which is less than 5% (Table 6), indicating the rejection of the null hypothesis of this test. Of the observations, 7.47% (Q), 87.9% (ROA), and 94.19% (ROE) fall into the lower regime; and 92.53% (Q), 12.1% (ROA), and 5.81% (ROE) into the upper regime.

Table 5. Estimation results of a threshold effect of firm size on leverage–performance nexus.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Q			ROA			ROE		
VARIABLES	Lower Size Regime	Upper Size Regime	Difference	Lower Size Regime	Upper Size Regime	Difference	Lower Size Regime	Upper Size Regime	Difference
$Performance_{t-1}$	0.864 ***	−0.184 ***	−1.048 ***	0.412 ***	0.393 ***	−0.019	0.431 ***	0.646 ***	0.215 ***
	(0.00333)	(0.00374)	(0.0004)	(0.0132)	(0.0735)	(0.0603)	(0.0121)	(0.0810)	(0.0689)
Debt	0.361 ***	−0.302 **	−0.663 **	−0.0952 ***	0.498 ***	0.5932 ***	−0.0452 **	0.394 ***	0.4392 ***
	(0.137)	(0.140)	(0.003)	(0.0167)	(0.0565)	(0.0398)	(0.0190)	(0.0996)	(0.0806)
LIQ	0.704 ***	−0.676 ***	−1.38 ***	0.0308 ***	−0.123 ***	−0.154 ***	0.0324 ***	−0.235 ***	−0.267 ***
	(0.0508)	(0.0528)	(0.002)	(0.00656)	(0.0347)	(0.0281)	(0.00747)	(0.0617)	(0.0542)
TANG	0.0216	0.0464	0.0248	−0.0727 ***	0.354 ***	0.4267 ***	−0.0482 ***	0.0131	0.0613
	(0.0731)	(0.0773)	(0.0042)	(0.0103)	(0.0425)	(0.0322)	(0.00971)	(0.0862)	(0.0765)
Tax	−1.317 ***	0.154	1.471 ***	−0.138 ***	−0.853 ***	−0.715 ***	−0.271 ***	−1.623 ***	−1.352 ***
	(0.123)	(0.146)	(0.023)	(0.0398)	(0.0942)	(0.0544)	(0.0562)	(0.144)	(0.0878)
INF	9.906 ***	−9.970 ***	−19.88 ***	−0.0123	0.291 ***	0.3033 ***	0.0345	−0.481 **	−0.5155 **
	(0.238)	(0.231)	(0.007)	(0.0172)	(0.0851)	(0.0679)	(0.0299)	(0.188)	(0.1581)
GDPG	−19.70 ***	19.72 ***	39.42 ***	0.146 ***	−0.853 ***	−0.999 ***	0.0356	−0.0930	−0.1286
	(0.375)	(0.374)	(0.001)	(0.0251)	(0.144)	(0.1189)	(0.0286)	(0.277)	(0.2484)
constant			2.244 ***			−0.151 ***			0.0816
			(0.0470)			(0.0282)			(0.0650)
Threshold value ($\hat{\gamma}$)	9.126 *** [9.051, 9.201]			15.48 *** [14.932, 16.026]			16.816 *** [16.138, 17.495]		
Percentage (%)	7.47%	92.53%		87.9%	12.1%		94.19%	5.81%	
Bootstrap (*p*-value)		0.000			0.000			0.000	
Observations	6986	6986	6986	6986	6986	6986	6986	6986	6986
Number of firms	499	499	499	499	499	499	499	499	499

Notes: This table presents the results of the estimation of the dynamic panel threshold regression model using the command "xthenreg" of Stata 16, Equation (1). The dependent variable is the Q (columns 1–3), ROA (columns 4–6), and ROE (columns 7–9). The prefix $t-1$ indicates that performance was lagged by one year. Bootstrap is the bootstrap linearity test. Standard errors are shown in parentheses. *** and ** represent the significances of the variables at the 1% and 5% levels, respectively.

Table 6. Estimation results of alternative regression methods.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
		Q			ROA			ROE	
VARIABLES	**Lower Size Regime**	**Upper Size Regime**	**Difference**	**Lower Size Regime**	**Upper Size Regime**	**Difference**	**Lower Size Regime**	**Upper Size Regime**	**Difference**
LEV	2.555 ***	−2.318 ***	−4.873 ***	−0.112 ***	0.787 ***	0.899 ***	−0.158 ***	1.165 ***	1.323 ***
	(0.333)	(0.346)	(0.013)	(0.0239)	(0.108)	(0.0841)	(0.0465)	(0.199)	(0.1525)
LIQ	0.936 ***	−0.896 ***	−1.832 ***	0.0180 ***	0.0766	0.0586	0.0463 ***	−0.0274	−0.0737
	(0.138)	(0.144)	(0.006)	(0.00593)	(0.0634)	(0.05747)	(0.0120)	(0.104)	(0.092)
TANG	−0.715 ***	0.704 ***	1.419 ***	−0.0112	−0.396 ***	−0.385 ***	−0.0349	−0.652 ***	−0.617 ***
	(0.130)	(0.137)	(0.007)	(0.0109)	(0.0758)	(0.0649)	(0.0219)	(0.151)	(0.1291)
Tax	−2.131 ***	−0.296	1.835 ***	−0.264 ***	0.105	0.369 ***	−0.489 ***	−0.317	0.172
	(0.647)	(0.706)	(0.059)	(0.0549)	(0.0994)	(0.0445)	(0.0850)	(0.247)	(0.162)
INF	9.488 ***	−9.868 ***	−19.356	0.0434 **	−0.00768	0.0511	0.0583	−0.246	−0.3043
	(0.722)	(0.707)	(0.015)	(0.0194)	(0.152)	(0.1326)	(0.0362)	(0.304)	(0.2678)
GDPG	7.078 ***	−6.543 ***	−13.62 ***	0.122 ***	−1.660 ***	−1.782 ***	0.286 ***	−2.911 ***	−3.197 ***
	(0.808)	(0.834)	(0.026)	(0.0381)	(0.286)	(0.2479)	(0.0775)	(0.468)	(0.3905)
constant			−0.0458			−0.115 *			−0.115
			(0.0916)			(0.0597)			(0.106)
Threshold value ($\hat{\gamma}$)		9.461 *** [9.176, 9.744]			16.65 *** [15.936, 17.362]			16.48 *** [15.624, 17.339]	
Bootstrap (p-value)		0.150			0.020			0.040	
Observations	6986	6986	6986	6986	6986	6986	6986	6986	6986
Number of firms	499	499	499	499	499	499	499	499	499

Notes: This table presents the results of the estimation of the static panel threshold regression model using the command "xthenreg" of Stata 16, Equation (1). The dependent variable is the Q (columns 1–3), ROA (columns 4–6), and ROE (columns 7–9). Bootstrap is the bootstrap linearity test. Standard errors are shown in parentheses. ***, **, and * represent the significances of the variables at the 1%, 5%, and 10% levels, respectively.

To analyze the results more clearly, we will discuss the results by each performance measure (Q, ROA, and ROE). Therefore, we will start with the analysis of the first model, which takes the Tobin's Q (market value (Q)) as a performance measure (Column 1, 2, and 3). Using Size as the transition variable, the threshold value is estimated at 9.126 (the equivalent firm size is $1 million). Furthermore, the coefficients associated with the debt variable are significant for both regimes (lower and upper). In the lower regime reflecting small firms, the estimated coefficient is positive and statistically significant, showing the existence of a positive relationship between debt and Tobin's Q. However, in the upper regime representing large firms, the estimated coefficient is negative and statistically significant, indicating the presence of a negative relationship between leverage and Tobin's Q. Based on our results, the lower regime appears to be the optimal regime, since the coefficient is greater than the upper regime coefficient. Specifically, a 10.0% Debt will lead to a 3.61% increase in ROA.

As for the ROA model analysis (Columns 4, 5, and 6), the threshold value is estimated at 15.48 (the equivalent firm size is $5 million). Furthermore, the coefficients of the variable (*Debt*) in both regimes are statistically significant at the 1% level. In the lower regime, qualifying the small firm regime, the estimated coefficient is negative and statistically significant, showing that debt exerts a negative impact on firm performance (ROA). According to these results, the optimal regime corresponds to the upper regime, since the coefficient is greater than the coefficient. Specifically, a 10.0% Debt will lead to a 4.98% increase in ROA.

Turning to the ROE model analysis (Columns 7, 8, and 9), the threshold value is estimated at 16.816. (The equivalent firm size is $20 million.) The coefficients of the variable (*Debt*) in both regimes are statistically significant at the 1% level. In the lower regime, the estimated coefficient is negative and statistically significant, indicating that leverage negatively affects the firm's financial performance (ROE). Based on these results, the optimal regime corresponds to the upper regime, since the coefficient is greater than the coefficient. Specifically, a 10.0% Debt will lead to a 3.94% increase in ROE.

In addition, the coefficient of lagged performance (Q, ROA, and ROE) is statistically significant and positive in both regimes, except for the Q model in the upper regime, which shows that the current performance is affected by the increase in performance in the

previous period. These results are explained by the presence of adjustment costs that are related to the financial decisions of the listed firms in the MENA region.

Certainly, the results found on the control variables have allowed for further analysis of the regressed models. Let us start with the liquidity variable (*LIQ*); its coefficients have opposite signs. In the lower regime (columns (1), (4), and (7)), the *LIQ* coefficients are positive and statistically significant. The positive relationship between liquidity and the performances of the MENA firms can be explained by their ability to meet their short-term liabilities, as they have the necessary equity to manage their activities. More specifically, in column (1), small firms perform better because they hold sufficient internal funds. They can rely on self-financing to maximize their value (Tobin's Q). Furthermore, in columns (4) and (7), small firms rely on self-financing to increase their performance (ROA and ROE). This result is clearly in line with the pecking-order theory, where following a hierarchical financing order constitutes a drastic condition to avoid the costs arising from perfect information. However, in the upper regime (columns (2), (5), and (8)), regarding the negative relationship between liquidity and firm value (Tobin's Q), large firms do not hold sufficient internal funds to increase their investment opportunities. In this case, the lack of liquidity reduces the firm value. Similarly, the negative relationship between liquidity and firm performance (ROA and ROE) could be explained by the fact that the internal funds needed to finance investment projects and to improve the profitability of large firms are exhausted. Consequently, they are forced to resort to debt to compensate for the lack of liquidity.

Similarly, the coefficients of the tangibility variable (TANG) are of opposite signs and are significant at the 1% level. In the lower regime (columns (4) and (7)), tangibility has a negative effect on firm performance (as measured by ROA and ROE). This result indicates that small firms do not hold sufficient tangible assets to grant them as collateral when accessing credit. By contrast, in the upper regime (column 5), tangibility has a positive effect on firm performance (ROA). This result reflects large firms' detention of large tangible assets, and their ability to access credit to improve their profitability and reinvestment opportunities.

Except for column (2), the coefficients of the Tax variable are all negative and statistically significant at 1%. The negative effect of the non-debt tax shield on firm performance is explained by the fact that MENA firms tend to minimize the payment of income taxes through recourse to debt. In this case, to limit the massive recourse to debt and the payment of debt taxes, these firms will increase their depreciation charges. Indeed, they use their internal funds to finance their activities. This shows that the increase in financial charges has a negative impact on the MENA firm performance.

Similarly, the economic cycle variables (i.e., inflation and GDP) seem to be important determinants of the performances of MENA firms. As for the inflation variable (INF), it turns out that the signs of its coefficients are different and statistically significant. In columns (1) and (5), we find that inflation has a positive and statistically significant effect on the ROA and Tobin's Q. The positive relationship between inflation and Tobin's Q (ROA) indicates that increasing inflationary effects do not prevent small (large) firms from investing or from taking advantage of good growth opportunities. Moreover, this result could also be explained by lower tax rates. According to Gonedes (1981), the lower tax rate compensates for the negative impact of inflation on profitability. This should help MENA firms to increase their reinvestment opportunities and profitability. However, in the upper regime (see columns (2) and (8)), the negative relationship between inflation and firm value (financial profitability) reflects the inability of large firms to make profits due to increasing inflationary effects. Indeed, when the inflation rates are too high, the costs (debt costs, agency costs, transaction costs, etc.) will also be increasingly high.

The coefficients of the variable GDPG have divergent signs and are significant at the 1% level. As for the negative relationship between GDP and firm performance, it indicates that economic growth does not necessarily improve firm growth in the MENA region (see columns (1) and (5)). This result could also be attributed to the measure chosen by the

researcher. In fact, GDP is a global measure. It affects all sectors. However, our sample is composed of several industrial firms, so perhaps the choice of a specific measure such as the industrial production growth rate brings about more robust results (see Khémiri and Noubbigh 2020). On the other hand, in columns (2) and (4), the positive relationship between GDP and performance is explained by the fact that the MENA growth recovery contributes to the maximization of the profitability of non-financial firms.

4.3. Robustness Test: Static Panel Threshold Regression Model

The robustness test focuses on the adoption of the static panel threshold regression model proposed by Seo and Shin (2016) and (Seo et al. 2019). This model also explores the nonlinear relationship between debt and firm performance, and estimates the firm size threshold value. Table 6 reports on the different results of the static panel threshold regression model. The results show that the estimated threshold values of 9.461, 16.65, and 16.48 are close to the threshold values that are estimated by the main results. These results are approximately similar to the main findings. Similarly, the results obtained for the control variables keep almost the same signs that are found in the main results.

4.4. Discussion

To discuss the results, we will discuss the results according to each performance measure. Regarding Tobin's Q model, the result shows a threshold effect of firm size on the debt–performance nexus. This indicates that our Hypothesis 1 is valid. Indeed, under a lower regime, the result shows that there is no conflict of interest between the managers of small firms and their investors. Therefore, the use of debt could be an effective way for managers to disclose the financial situation of their firm to investors. They focus on this informational advantage to minimize the costs of information asymmetry. As a result, they can attract more investors and maximize shareholder wealth. These results are then explained by the fact that small firms in the MENA region are considered by investors as being good firms, since they use medium-term debt as a signal to inform the market about their management quality. Under an upper regime, this result shows that large firms are considered by investors to be risky firms because they require a higher debt than their smaller counterparts (in a lower regime). More precisely, their excessive access to credit generates costs that are too high, and conflicts of interest. In this case, medium-term debt is not a good signal for large firms because it deteriorates shareholder value. This deterioration could be explained more fully using the following two reasons. On the one hand, the massive recourse of large firms to debt generates debt costs that are too high. These costs increase progressively when the inflation rate increases. This in turn affects the firm value. On the other hand, the disclosure of financial information (debts and profits) imposes more taxes. In this case, the excessive payment of corporate tax reduces the firm's value. In general, to choose the optimal regime, we follow Khémiri and Noubbigh (2020) based on the estimated coefficient. More precisely, the highest coefficient reflects the optimal regime.

Similarly, the result of the ROA model confirms the validity of our Hypothesis 1, indicating the threshold effect of firm size on the debt–performance nexus. This negative impact of leverage on ROA (the results of a lower regime) can be explained by the fact that small firms need to avoid the use of debt because they often find themselves paying back the amount of debt at maturity due to the information asymmetry problem and high costs. These firms must rely on cash flow (especially retained earnings) to invest and increase their profitability. Through this financing strategy, small firms will be able to avoid facing the financial market, providing information on their investment projects, and bearing very expensive issuance costs. This result is consistent with the one found by Zeitun and Tian (2014). Based on these results, the pecking-order theory is confirmed. However, the result of the upper regime suggests the ability of large firms to take on debt to improve profitability. To do so, they rely on debt to take advantage of the tax benefits that they have (tax savings). They demand credit until they reach a satisfactory level of

debt, thus enhancing the maximization of their performance level. This undeniably reflects that there is a relationship of confidence between the lenders and the managers of firms in the MENA region; hence, the absence of imperfect information. This finding has been confirmed by some previous studies (Jaisinghani and Kanjilal 2017; Ibhagui and Olokoyo 2018; Khémiri and Noubbigh 2020). In this case, the predictions of the trade-off theory are accepted.

Regarding the ROA model, the result shows a threshold effect of firm size on the debt–performance nexus. This indicates that our Hypothesis 1 is also valid. Indeed, under a lower regime, the negative effect of Debt on the ROE (a lower regime result) of small firms indicates their incapacity to rely on leverage financing to invest and to improve their profitability. This incapacity could be attributed to the increase in financial costs (high-interest rates). Similarly, debt is not an adequate means of financing for small firms, as they face certain risks arising from imperfect information and conflicting interests among stakeholders (especially lenders and firms). They must rely on retained earnings and depreciation allowances to maximize shareholder benefits. This implies that interest rates are higher than the ROE. They could generate a financial risk and a real deterioration of the global value of firms in the MENA region. The pecking-order theory is accepted. However, in the upper regime, the estimated coefficient is positive and statistically significant. Economically, large firms count on debt to increase their performance. Specifically, they use it to increase their investment capacity and benefit from tax savings, which in turn affects their profitability. This finding suggests that debt helps the managers of large firms to take advantage of investment and growth opportunities, which improves their performance. The trade-off theory is accepted. Finally, our results are supported by a robustness test.

5. Conclusions

This paper examines the nonlinear relationship between debt and firm performance. Specifically, it examines the size threshold effect on the debt–performance nexus. To do this, we use the DPTR model. The sample was composed of 499 firms from 10 MENA countries (Bahrain, Egypt, Jordan, Kuwait, Lebanon, Morocco, Oman, Qatar, Saudi Arabia, Tunisia, and UAE) covering the period 2007–2020. This paper makes several contributions to the current literature. First, we add to the ongoing debate on whether corporate financing decisions depend on firm performance. This is important, to better understand the research question, as the current literature is inconclusive. Second, we provide an empirical analysis in the context of the MENA region. This is an important contribution, as it is commonly accepted that the results obtained in the context of advanced countries may not be generalized to the MENA context. From an empirical viewpoint, the utilization of the Dynamic Panel Threshold Regression (DPTR) model could better explain the nonlinear relationship between debt and firm performance. This is important, since most previous studies have used the static threshold model.

The main finding shows that there is a nonlinear relationship between debt and firm performance (Tobin's Q, ROA, and ROE). Specifically, the threshold values of firm size for the three models are estimated at 9.126 (about $1 million), 15.48 (about $5 million), and 16.816 (about $20 million), respectively, between the low- and the high-sized regimes. In the lower regime, the firm's value (Q) increases when debt increases; however, in the higher regime, this value decreases when the debt increases. Furthermore, in the lower regime, the performance (ROA and ROE) of small firms decreases when debt increases; however, in the upper regime, when debt increases, the performance of large firms increases. The results are several robustness tests. These findings support the predictions of the signaling, pecking order, and trade-off theories. In sum, the acceptance of one theory over another in the MENA region requires a consideration of the role of firm size in determining the debt–firm performance nexus.

5.1. Policy Implications

In view of our conclusions, some policy implications could be considered by MENA managers. First, MENA managers should choose the right financing strategies to improve the performance of their firms. This choice depends specifically on firm size. At a total asset threshold of less than $1 million, small firms' managers should use debt to improve the value of their firm (Tobin's Q). However, at a total asset threshold of below $5 million and $20 million, they should limit their use of debt to increase the return on assets (ROA) and the return on equity (ROE), respectively. On the other hand, above these thresholds, managers of large firms should reduce their use of debt to increase the value of their firms (Tobin's Q). However, they must use debt to improve the performance (ROA and ROE) of their firms. Secondly, MENA managers also need to be vigilant in adopting appropriate financing strategies, by taking into consideration the roles of monetary, fiscal, and economic policies in determining the performances of their firms.

5.2. Limitations and Future Research

Although our study offers interesting results, it has some limitations. First, it focuses on MENA-listed non-financial companies. Therefore, future studies should focus on the financial leverage of MENA financial companies to see if the results can be generalized. Second, institutional quality is not considered in the current study. Therefore, how institutional quality influences the leverage and performance of MENA firms can be examined in future studies. The current study shows that there is a threshold effect of firm size on the MENA debt–performance link. Thus, a similar study can be replicated in other developing and developed countries that have not yet been studied.

Author Contributions: Conceptualization, E.F.A. and S.s.D.; methodology, E.F.A., S.s.D.; software, H.h.E.E.; validation, E.F.A., H.h.E.E., S.s.D.; formal analysis, E.F.A., H.h.E.E.; investigation, H.h.E.E. and S.s.D.; resources, E.F.A. and S.s.D.; data curation, H.h.E.E.; writing—original draft preparation, E.F.A.; writing—review and editing, S.s.D.; visualization, H.h.E.E.; supervision, E.F.A.; project administration, E.F.A.; funding acquisition, E.F.A., H.h.E.E., and S.s.D. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Data Availability Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

Conflicts of Interest: The authors declare no conflict of interest.

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