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## Article

# Financial shock and the United States multinational and domestic corporations leverage

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Faisal Alnori

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\*Corresponding author: Faisal Alnori, Department of Finance, Faculty of Economics and Administration, King Abdulaziz University, Jeddah 80200, Kingdom of Saudi Arabia E-mail: falnore@kau.edu.sa

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# FINANCIAL ECONOMICS | RESEARCH ARTICLE Financial shock and the United States multinational and domestic corporations leverage

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Faisal Alnori<sup>1</sup>\*

Abstract: Puzzling findings from prior studies demonstrated that US multinational corporations (MNCs) capital structure include significantly lower leverage than their domestic counterparts. This study utilized the period of the 2008- Global Financial Crisis (GFC) to compare the leverage ratios between MNCs and Domestic Corporations (DCs) to provide a new approach to testing whether the lower expected bankruptcy cost of MNCS enables them to use more leverage than their domestic counterparts. The data used includes Compustat non-financial firms over the years 2002–2019 and the empirical method applied is the panel data fixed effects regression. Consistent with prior studies, the results show that MNCs capital structure includes lower leverage levels in comparison to their domestic counterparts before and post the GFC period. However, in the 2008 financial shock event, this study explores that MNCs have significantly higher market and book leverage than purely domestic firms. This higher leverage of MNCs is attributed to their lower expected bankruptcy arising from their international diversification of operations and their advantage in accessing external financial markets. Prior research justified MNCs' lower leverage ratios to higher agency costs. Nevertheless, the current study confirms that the trade-off theory's bankruptcy cost is still empirically relevant. The findings are robust after employing alternative robustness checks. At best, this is the first study that compares the capital structure of MNCs and DCs during times of financial shock and credit constraint.

Subjects: Corporate Finance; Economics

Keywords: Capital structure; domestic corporations; financial crisis; international diversification; multinational corporations

JEL classification: G3; G32; G01; F23

### 1. Introduction

Multinational corporations are essential contributors to global economic growth. One of the critical features of MNCs' success repeatedly stated in the literature is their access to different international financial markets and thus their ability to deal with capital market frictions (Akhtar, 2017; Alnori, 2021; Iwaki, 2019; Jones et al., 2020; Park et al., 2013; Wang et al., 2020). International finance studies predict that multinational corporations' capital structure should have higher





© 2023 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group. This is an Open Access article distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/4.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited. The terms on which this article has been published allow the posting of the Accepted Manuscript in a repository by the author(s) or with their consent. leverage than purely domestic corporations (DCs). This is because MNCs have a lower expected bankruptcy cost of debt resulting from their international diversification of operations in different uncorrelated economies and their access to international capital markets (Agmon & Lessard, 1977; Shapiro, 1978). In contrast, empirical studies puzzlingly found that MNCs have significantly lower leverage ratios than DCs (e.g. Burgman, 1996; Doukas & Pantzalis, 2003; Lee & Kwok, 1988; Wang et al., 2020).

The existing literature, which found that MNCs' capital structure includes significantly lower leverage than DCs, mostly attributed this lower leverage ratio of MNCs to their higher agency cost resulting from the complexity of the international environment (e.g., see Burgman, 1996; Chen et al., 1997; Doukas & Pantzalis, 2003; Erel et al., 2020; Lee & Kwok, 1988; Mittoo & Zhang, 2008; Park et al., 2013). However, these studies did not investigate the leverage levels between the two groups of firms during financial shock or credit constraint periods, such as the 2008 global financial crisis (the GFC). Therefore, the objective of this study is to fill this gap by comparing the leverage levels between MNCs and DCs during the 2008-financial shock. During the 2008-GFC, the supply of funds became less, and the risk of default noticeably increased (Alnori, 2021; Kahle & Stulz, 2013). Unlike DC, MNCs are better able to access different markets and have lower expected bankruptcy cost since they operate in different uncorrelated economies (Ali et al., 2022; Alnori, 2021; Park et al., 2013). Therefore, the central question in the current study is whether the case of the lower leverage levels seen with MNCs will be experienced compared to DCs during a financial shock period.

The GFC is regarded by many researchers as the most severe economic crisis since the Great Depression in the 1930s (Akbar et al., 2013; Zaman et al., 2021). The GFC adversely affected the financial market in the US and worldwide (e.g., Campello et al., 2010; Kahle & Stulz, 2013; Lins et al., 2017; McLean & Zhao, 2014; Zaman et al., 2021). Further, Bartram and Bodnar (2009) report a greater than 56% decrease in the global equity market value during the GFC. This drop is equivalent to US\$29 trillion, or half of the world's total GDP in 2007.

The GFC should unequally impact MNCs and DCs capital structure decisions. MNCs are better able to access external financial markets than DCs in a such period where the supply of funds decreased because of an increase in the cost of capital and the high risk of default (Akbar et al., 2013; Alnori, 2021; Campello et al., 2010; Fosberg, 2012; Iqbal & Kume, 2014; Kahle & Stulz, 2013; Zaman et al., 2021). In line with classical thought (Agmon & Lessard, 1977; Shapiro, 1978), MNCs would have had access to external financial markets and more financing channels than DCs during the GFC. Further, MNCs' international diversification would have lowered their default risk compared to DCs.

As mentioned, during the 2008-GFC, the supply of funds became less, and the risk of default noticeably increased (Campello et al., 2010; Kahle & Stulz, 2013). Further, the condition of the economy is an important factor shaping firms' capital structure decisions (e.g., Bhamra et al., 2010; Covas & Den Haan, 2011, 2012; He & Kyaw, 2021; Korajczyk & Levy, 2003; Zaman et al., 2021), and the corporate capital structure decisions vary between good and poor macroeconomics times (Cook & Tang, 2010; He & Kyaw, 2021). Accordingly, and following the trade-off theory, MNCs' lower expected bankruptcy cost, resulting from their operations in different uncorrelated economies and access to international financial markets, may enable MNCs to use more debt than DCs in a financial shock event. Therefore, the current study hypothesizes that during 2008-GFC, MNCs' capital structure should include more debt than their DCs counterparts.

This study extends the existing literature in the following ways. First, prior studies comparing MNCs and DCs capital structure report that MNCs have lower leverage levels in comparison to their domestic counterparts due to MNCs' higher agency cost resulting from the complexity of the international environment (Jones et al., 2020; Lee & Kwok, 1988; Park et al., 2013). These studies postulate that the agency theory is better able to explain MNCs capital structure than the trade-off

theory. However, the current study is the first that compares the leverage levels between US MNCs and DCs during a financial shock event (i.e., the 2008-GFC). Essentially, the focus on the 2008-financial shock to compare MNCs and DCs leverage advances the existing literature by demonstrating that the trade-off theory's expected bankruptcy is successful to predict MNCs' capital structure decisions. Second, unlike most empirical studies comparing MNCs and DCs capital structure, which applies market leverage to proxy capital structure (i.e., Alnori, 2021; Burgman, 1996; Chen et al., 1997; Doukas & Pantzalis, 2003; Mittoo & Zhang, 2008), the current study applies both market leverage and book leverage measures of capital structure to ensure that the outcomes of the study are not driven by mechanical effects (i.e., the decline in the equity prices during the 2008-GFC). Third, prior studies report that agency theory is better able to explain the capital structure decision of MNCs, but the trade-off theory is not empirically successful. However, the current study utilizes the 2008-GFC to provide a new approach to test the trade-off theory's expected bankruptcy to explain MNCs and DCs capital structure choices.

Prior studies find that US MNCs have lower leverage than their domestic counterparts (Burgman, 1996; Chen et al., 1997; Doukas & Pantzalis, 2003; Erel et al., 2020; Lee & Kwok, 1988; Mittoo & Zhang, 2008). Nevertheless, the current study finds that these lower leverage levels in MNCs disappeared during the 2008-year. More specifically, in the 2008-financial shock, the current study explored that US MNCs' target capital structures include significantly higher debt levels than DCs.

In relation to finance theory, the findings of this study showed that both the agency cost and the trade-off theory's expected bankruptcy are relevant to MNCs' capital structure decisions. More specifically, in times of good economic conditions, where there is no credit constraint and no financial shock, the target capital structure for MNCs has lower debt in comparison with DCs because of the high agency cost of MNCs, as reported in prior studies (e.g., Burgman, 1996; Chen et al., 1997; Doukas & Pantzalis, 2003; Lee & Kwok, 1988). In contrast, during financial shock and credit constraint periods, MNCs' target leverage ratios include more debt compared to DCs because of MNCs' lower expected bankruptcy cost, which is consistent with the trade-off theory.

The remainder of this paper is organized as follows: Section 2 reports the literature review and hypothesis development. Section 3 presents the data and the empirical method employed in the study. Section 5 presents the empirical results. Section 6 provides alternative robustness checks. Finally, Section 7 concludes.

#### 2. Theoretical background, literature review, and hypothesis

#### 2.1. Theoretical background

Since the publication of Modigliani and Miller in 1963, well-developed theories have been introduced to explain why an optimal capital structure should exist. Kraus and Litzenberger (1973) postulate that corporates' capital structure choice should represent a trade-off between the benefit of debt (i.e., as a tax shield) and the cost of debt (i.e., the increase of expected bankruptcy). From this perspective, the trade-off theory predicts that optimal financial structure is achieved when the marginal benefits and cost of leverage are equalized.

Jensen and Meckling's (1976) agency theory expects that corporates' financial structure choices should be shaped to minimize the conflict between firms' insiders (i.e., managers) and outsiders (i.e., shareholders and bondholders). More specifically, the optimal capital structure may exist when monitoring, bonding, the tax shield benefit of debt, and other agency cost-relevant elements are balanced.

The pecking order theory states that capital structure choices should be made to reduce corporate investment inefficiency resulting from information asymmetry (Myers & Majluf, 1984; Myers, 1984). Since firms' internal financing is not priced in the financial market, it is associated

with lower information asymmetry than external financing; thus, internal funds should be the first financing choice. Nevertheless, if internal financing is insufficient, debt should be the second funding option, and equity should come as the last option.

#### 2.2. Literature

### 2.2.1. Leverage of MNCs and DCs

There is a strand of capital structure literature that worked on comparing the capital structure decisions between MNCs and DCs (e.g., Akhtar, 2017; Alnori, 2021; Burgman, 1996; Chen et al., 1997; Doukas & Pantzalis, 2003; Jones et al., 2020; Lee & Kwok, 1988; McMillan & Camara, 2012; Mittoo & Zhang, 2008; Park et al., 2013; Wang et al., 2020). These studies predict that MNCs and DCs capital structure decisions should vary since MNCs financial decisions are influenced by factors related to the international arena, which DCs are not relatively subject to. More specifically, MNC's financial choices are affected by international taxation differences (Ali et al., 2022; Akhtar, 2017; Desai et al., 2004Alnori, 2021), international diversification and the availability of funds internationally (Lee & Kwok, 1988), and exchange rate risk (Burgman, 1996).

Existing literature compared the capital structure of MNCs and DCS found that MNCs capital structure includes significantly lower leverage levels in comparison to domestic firms (Doukas & Pantzalis, 2003; Erel et al., 2020; Jones et al., 2020; Mansi & Reeb, 2002a; Mittoo & Zhang, 2008). These studies explained the lower leverage levels of MNCs to the higher agency cost associated with the complexity of the international environment. Nevertheless, although some recent studies showed that globalization hurts MNCs' stock prices (Guedhami et al., 2022), the lower leverage levels of MNCs is inconsistent with the classical view that MNCs capital structure should include more debt, due to MNCs lower expected bankruptcy, because of their operation in different uncorrelated economies and their ability to access different financial markets (Agmon & Lessard, 1977; Hughes et al., 1975; Rugman, 1976). At best, the empirical studies, which investigate MNCs and DCs capital structure decisions (e.g., Alnori, 2021; Doukas & Pantzalis, 2003; Erel et al., 2020; Jones et al., 2020; Mittoo & Zhang, 2008; Park et al., 2013) did not compare the leverage levels in MNCs and DCs' capital structure during times of financial shock, high default risk and credit constrained such as the 2008-GFC.

#### 2.2.2. GFC and corporate leverage

Extensive studies showed the important role of macroeconomic conditions on firms' financing decisions (Bhamra et al., 2010; Covas & Den Haan, 2012; Graham et al., 2015; He & Kyaw, 2021; Korajczyk & Levy, 2003; Zaman et al., 2021). Firms' capital structure decisions differ between periods of poor and good macroeconomic conditions. For instance, Cook and Tang (2010) and He and Kyaw (2021) found that firms' speed of adjustment to their target capital structure during periods of good macroeconomic conditions is greater than in periods of poor macroeconomic conditions. Custódio et al. (2013) and Drobetz and Wanzenried (2006) postulate that poor macro-economic conditions force firms to deviate from their target capital structure because the economy's condition is correlated with default risk, thus influencing firms' financing decisions.

The 2008-GFC influenced firms' financing decisions worldwide (e.g., Campello et al., 2010; Fosberg, 2012; Iqbal & Kume, 2014; Kahle & Stulz, 2013; Zaman et al., 2021). For example, Fosberg (2012) confirmed that US firms increased their leverage ratios due to the impact of the financial crisis. Further, several studies have shown that the GFC impacted financing decisions for firms outside the US, such as non-financial firms in the United Kingdom, France, and Germany (e.g. Akbar et al., 2013; Zaman et al., 2021) and 42 other countries (e.g. Alves & Francisco, 2015). Moreover, Campello et al. (2010) surveys involving chief financial officers from US, European and Asian firms confirm that the GFC impacted firms' financing decisions worldwide. Zaman et al. (2021) showed that firms' capital structure decisions vary between pre-crisis and post-crisis periods. In summary, the period of the GFC was associated with a significant drop in the capitalization of financial markets, credit constraints, and firms' tendency to undertake investment decisions, along with high default risk.

#### 2.3. Hypothesis

Following the trade-off theory, classical international finance studies assumed that MNCs' capital structure should include higher leverage than DCs (Agmon & Lessard, 1977; Hughes et al., 1975; Rugman, 1976) because the former have relatively lower expected bankruptcy cost of debt since they can diversify their cash flows internationally and can access external capital markets (Ali et al., 2022; Alnori, 2021; Park et al., 2013). In contrast, empirical studies found that US MNCs have significantly lower leverage ratios than their domestic peers (Burgman, 1996; Chen et al., 1997; Doukas & Pantzalis, 2003; Jones et al., 2020; Lee & Kwok, 1988; McMillan & Camara, 2012; Wang et al., 2020). These studies explained the lower leverage of MNCs to higher agency cost due to the complexity of the international environment. However, these studies did not examine the role of trade-off theory's expected bankruptcy by comparing the leverage ratios between the two sets of firms during financial shock events, such as the 2008-GFC, where the supply of credit declines and the risk of default increases, impacting corporate financing decisions (Campello et al., 2010; Fosberg, 2012; Kahle & Stulz, 2013; Zaman et al., 2021).

The focus on the 2008 GFC period demonstrates the critical role of the trade-off theory in understanding bankruptcy cost when studying the capital structure of MNCs and DCs. Since classical international studies postulated that MNCs have a lower expected bankruptcy cost of debt (e.g., Agmon & Lessard, 1977; Hughes et al., 1975; Rugman, 1976), it is expected that at times of financial shock, the leverage levels of MNCs will be different from DCs' leverage levels. According to Frank and Goyal (2009), the trade-off theory predicts that firms with a lower bankruptcy cost should be financed with more debt. Thus, focusing on the GFC period and comparing MNCs' and DCs' capital structures may provide empirical evidence regarding how the lower expected bankruptcy cost of MNCs—as a result of their diversification of operations and access to external capital markets—is an important and relevant factor in MNCs' capital structure and enables such firms to be more leveraged, in comparison with DCs, during periods of financial shock.

The central hypothesis in the current study is that the leverage levels of MNCs are expected to be higher than those of DCs, in the 2008-GFC. At such a time, the supply of funds is expected to decrease because of an increase in the cost of capital, and the risk of default rises (Akbar et al., 2013; Campello et al., 2010; Fosberg, 2012; Kahle & Stulz, 2013; Zaman et al., 2021). Further, several studies showed that MNCs' stock prices are negatively influenced by globalization during periods of global economic drop (Guedhami et al., 2022).<sup>1</sup> However, unlike DCs, MNCs operate in different uncorrelated economies with different economic structures and have access to different financial markets globally (Ali et al., 2022; Alnori, 2021; Jones et al., 2020; Mittoo & Zhang, 2088; Agmon & Lessard, 1977; Shapiro, 1978), which may allow them to overcome the barriers of capital flows that create segmentation across US financial markets (Lee & Kwok, 1988; Mittoo & Zhang, 2008). Under these circumstances, MNCs are expected to issue debt at a lower cost. Thus, the factors mentioned above (i.e., international diversification of operations and access to external financial markets) may decrease MNCs' bankruptcy cost of debt, which is expected to enable MNCs to have higher debt levels than DCs during the 2008-GFC.

As mentioned, to ensure that our results are not in

#### 3. Data and methodology

#### 3.1. Data

The sample period covers the years 2002–2019. The main reason why the study period begins in the year 2002 is to exclude the period incorporating prior drops in financial markets, such as the Dot Com crash of 2000 and the Asian Financial Crisis of 1997–1998. Further, the study avoids using a long-term time horizon to avoid time series problems. The current study uses all Compustat

firms, except financial firms (SIC 6000-6999) and utilities (SIC 4900-4999), since these firms' capital structures are influenced by regulations rather than being market-driven. The study excludes firms' observations that have negative book values of assets or equity. Further, all leverage measures missing values are deleted. All leverage measures and firms' characteristic variables are winsorized at the first and ninety-ninth percentiles to reduce outlier effects (Alnori, 2021).

Prior research applied various methods to classify MNCs, including foreign tax ratio (FTX), foreign sales ratio (FSR), foreign assets ownership, and the number of countries in which they have subsidiaries (Alnori, 2021). Burgman (1996) reports that using the FSR to classify MNCs has two drawbacks. First, it restricts the construction of a large sample. Secondly, it does not distinguish between firms that sell outside the US and firms that obtain international income sources.

Studies performed by Burgman (1996) and Lee and Kwok (1988) suggest that using the FTX to define MNCs has important upsides. The variable is directly available from Compustat and provides the opportunity to construct a large sample of MNCs (Alnori, 2021). Therefore, the current study applied the FTX to define MNCs. More specifically, Firms that report 10% or more FTX are classified as multinationals, while firms that report zero FTX are treated as purely domestic. Further, to appropriately classify MNCs and DCs, missing and negative values for the FTX are dropped (McMillan & Camara, 2012).

The current study also follows Burgman (1996) and constructs a second sample of US MNCs based on a 25% FTX (i.e., MNC25). The rationale for constructing the MNC25 sample is to ensure the differences between MNCs and DCs and to confirm that the outcomes are reliable in both MNCs' samples.

Park et al. (2013) report that the size of the firm is one of the main determinants of capital structure decisions. Consequently, this variable must be appropriately managed when comparing MNC and DC capital structures. This is done to avoid biased findings resulting from US MNCs being larger than US DCs. Most studies investigating the capital structures of US MNCs and DCs have applied alternative firms' total book assets cut-offs to reduce the size difference issue. For instance, several studies include only companies that have at least US\$10 million in total book assets (e.g., Chen et al., 1997; Lee & Kwok, 1988), whereas Burgman (1996) requires MNCs and Dcs to report at least US\$250 million in total assets. In this study, the main analysis follows Burgman's US\$250 million total assets cut-off to maximize the sample of MNCs and DCs. Table 1 presents the distribution of MNCs and DCs among industries in the study sample.

#### 4. Methodology

### 4.1. Defining capital structure

Most studies comparing capital structures between US MNCs and DCs consider the market leverage as a proxy for a firm's capital structure (e.g., Alnori, 2021; Burgman, 1996; Chen et al., 1997; Doukas & Pantzalis, 2003; Lee & Kwok, 1988). According to Flannery and Rangan (2006), empirical capital structure studies tend to downplay the importance of the book leverage ratio. However, survey evidence collected by Graham and Harvey (2001) confirms that firms' managers set a target capital structure based on book leverage.

This study applies both market and book leverage to measure MNCs' and DCs' capital structures. The main reason to apply book leverage in addition to market leverage is to ensure that the results are not driven by mechanical effects (e.g., the sharp decline in equity prices during the crisis). Book leverage is used to confirm that MNC and DC managers' decisions drive significant results. Market leverage is calculated according to:

#### Table 1. Industry Distribution of Firms in the Study Sample

The table presents the number of firms for MNC10, MNC25, and DC across Fama-French's 12 industries over the years 2002–2019. MNC10 (MNC25) includes firm–years in which the FTX is no less than 10% (25%); DC includes firm–years with zero foreign tax.

Industry code	Industry name	MNC10	MNC25	DC
1	Consumer non- durables	859	561	367
2	Consumer durables	546	454	81
3	Manufacturing	2189	1691	437
4	Oil, gas, and coal extraction and products	552	448	812
5	Chemicals and allied products	699	571	86
6	Business equipment	3115	2445	344
7	Telephone and television transmission	308	202	634
8	Utilities	0	0	0
9	Wholesale, retail, and some services	783	459	1687
10	Healthcare, medical equipment, and drugs	974	728	603
11	Finance	0	0	0
12	Other	1348	1005	1703
Total		11373	8564	6754

Market leverage 
$$= \frac{SDi, t + LDi, t}{SDi, t + LDi, t + Si, tPi, t}$$
(1)

where  $SD_{i,t} + LD_{i,t}$  is the firm's long-term plus short-term debt at time t, and  $S_{i,t} P_{i,t}$  is the firm's market value, which is computed as firms' outstanding common shares multiplied by the price per share at time t.

Book leverage is calculated according to:

Book leverage 
$$=$$
  $\frac{SD_{it} + LD_{it}}{TA_{it}}$  (2)

where  $SD_{i,t} + LD_{i,t}$  is the firm's short-term debt plus long-term debt at time *t*, and  $TA_{it}$  is the firm's total book value of assets.

#### 4.2. Defining the financial crisis

Relevant research has employed different crisis period classifications (Alnori, 2021). Several studies define the crisis as the years 2008 and 2009 and consider the years 2006 and 2007 as the precrisis period, and the years 2009 and 2010 as the post-crisis period (e.g., De Haas & Van Lelyveld, 2014; Iqbal & Kume, 2014). Other studies consider 2007–09 as the crisis period (e.g., Akbar et al., 2013). Bartram and Bodnar (2009) report that the banking and mortgage crisis occurred early in 2007 and that the equity market's reaction to the crisis came in mid-2008, influencing corporate financing in the middle of 2008. Hence, 2008 is recognized as the mid-crisis year.

#### 4.3. Variable selection

Following relevant studies that compare MNCs and DCs capital structure (e.g., Alnori, 2021; Park et al., 2013), the current paper controls *profitability*, growth opportunities (*MB*), firm size (*size*), the tangibility of assets (*TANG*), research and development (*RD*), earnings volatility (*EarnVol*), and the non-debt tax shield (*NDTS*). The variables applied are summarized in Appendix Table 1 and briefly described here:

- *MNC*: a dummy variable equal to 1 if the firm is an MNC and 0 if a DC. Following Doukas and Pantzalis (2003), this dummy variable is used to split the sample between US MNCs and DCs.
- *MNC\*Pre-Crisis*<sub>2006</sub>: an interaction variable, which is the product of the MNC dummy variable and the year 2006. The variable is used to compare the debt levels between MNCs and DCs in the year 2006.
- *MNC\*Pre-Crisis*<sub>2007</sub>: an interaction variable, which is the product of the MNC dummy variable and the year 2007. This variable is used to explore the leverage levels in MNC and DC capital structures in the year 2007.
- MNC\*Crisis<sub>2008</sub>: an interaction variable, which is the product of the MNC dummy variable and the year 2008. According to Bartram and Bodnar (2009) and Alnori (2021), the GFC affected corporate financing in mid-2008. Therefore, this interaction variable is applied to compare the leverage ratios of MNCs and DCs in the crisis period, which is the main variable in this study.
- *MNC\*Post-Crisis*<sub>2009</sub>: an interaction variable, which is the product of the MNC dummy variable and the year 2009. This variable is used to compare the capital structure of MNCs and DCs in the year 2009, which is considered part of the post-crisis period.
- *MNC\*Post-Crisis*<sub>2010</sub>: an interaction variable, which is the product of the MNC dummy variable and the year 2010. This variable is used to compare the capital structure of MNCs and DCs in the year 2010, which is considered the post-crisis period.
- *Profitability*: earnings before interest, taxes, depreciation, and amortization divided by total assets (Bugshan et al., 2021; Park et al., 2013). The pecking order theory predicts that firms with higher retained earnings tend to have lower debt because retained earnings decrease their need for external financing. However, according to the trade-off theory, firms with higher profitability are more levered since profitable firms have a lower cost of expected bankruptcy, and the interest tax shield is more valuable for profitable firms (Frank & Goyal, 2009).
- Growth opportunities (*MB*): the ratio of total assets minus book equity plus market value, divided by the book value of assets. Myers (1977) predicts a negative linkage between firms' investment opportunities and leverage, due to the problem of underinvestment. In addition, the trade-off theory assumes a negative nexus between firms' growth opportunities and leverage. However, a positive relationship between firms' growth and debt is predicted by the pecking order theory.
- Size: the natural logarithm of a firm's total assets(Saeed et al., 2023). Larger firms are less likely to be financially distressed because they can better access financial markets, have lower cash volatility, and have a lower expected bankruptcy cost (Alnori, 2021). However, a negative relationship between firm size and leverage is predicted by the pecking order theory because large firms have fewer informational asymmetry problems.
- Tangibility (TANG): the ratio of a firm's gross property, plant, and equipment divided by its total assets (Alnori & Alqhtani, 2019). According to Titman and Wessels (1988), Firms with more tangible assets can potentially use their assets as collateral and hence are likely to have lower expected bankruptcy costs. Therefore, asset tangibility should increase firms' leverage as predicted by the trade-off theory (Frank & Goyal, 2009). Nevertheless, tangible assets are associated with less information asymmetry, which decreases the cost of issuing equity (Harris & Raviv, 1991).
- *EarnVol*: the standard deviation of earnings before interest and taxes (EBIT) to total assets over the most recent 3 years (Alnori, 2021). Higher volatile earnings increase firms' risk of expected bankruptcy and decrease the utilization of a debt interest tax shield. Therefore, earnings volatility and leverage should be negatively related.
- Research and development investment (*RD*): the ratio of firms' expenses on research and development (R&D) divided by total assets. Firms with higher R&D expenses are more likely to have a higher expected bankruptcy cost and thus be financed with less debt (Titman, 1984).
- *NDTS*: the ratio of depreciation and amortization to total assets. Firms reporting higher depreciation expenses are predicted to use lower debt. This is because of the substitution effect of depreciation on debt (DeAngelo & Masulis, 1980).

#### 4.4. Methodology

The current study used interaction variables equal to the product of each year dummy 2006, 2007, 2008, 2009, and 2010, and the multinational dummy (MNC). The interaction variable (*MNC\*Crisis<sub>2008</sub>*) is the main variable in the regression model that compares the leverage ratios between MNCs and DCs in the middle of the crisis. A positive (negative) significant coefficient for an interaction variable (e.g., *MNC\*Crisis<sub>2008</sub>*) would indicate that MNCs, on average, exhibit higher (lower) leverage ratios than do DCs during the crisis period, and vice versa.

Following Alnori (2021), Doukas and Pantzalis (2003), and Lemmon et al. (2008), the current study applies the fixed effects estimator because the data in this study are panel that has both times series and cross-sectional dimensions. Thus, it is impossible to assume that the observations are independently distributed over time (Alnori, 2021). Further, Hsiao (1985) points out that OLS regressions provide a biased upward coefficient because of the effect of firms' unobserved heterogeneity. Consequently, a fixed-effects panel data estimation is applied as the main econometric method, as it can control unobserved firm effects.<sup>2</sup>

The fixed effects methodology provides consistent and unbiased coefficients (Akbar et al., 2013; Jeon & Miller, 2004; Love et al., 2007). Moreover, Sufi (2009) argues that fixed effects models eliminate firms' specific time-invariant factors that are omitted. Further, Akbar et al. (2013) point out that fixed effects models control a firm's unobservable effects and enable the researcher to distinguish between the crisis and pre-crisis period, which is critical for the present study. To ensure the appropriateness of the fixed effects estimation, the Hausman test is performed and it confirms that the fixed effects estimator is applicable.

The following panel data fixed effects regression is applied to compare MNC and DC capital structures during the GFC:

$$M_{leverage} = \beta_0 + \beta_1 MNC * 2006 + \beta_2 MNC * 2007 + \beta_3 MNC * Crisis2008 + \beta_4 MNC * 2009 + \beta_5 MNC * 2010 + \beta_6 MNC + B_7 profitability + \beta_8 MB + \beta_9 Size + \beta_{10} TANG + \beta_{11} EarnVol + \beta_{12} RD + \beta_{13} NDTS + \gamma i + \varepsilon_{it}$$
(3)

$$B_{leverage} = \beta_0 + \beta_1 MNC * 2006 + \beta_2 MNC * 2007 + \beta_3 MNC * Crisis2008 + \beta_4 MNC * 2009 + \beta_5 MNC * 2010 + \beta_6 MNC + B_7 profitability + \beta_8 MB + \beta_9 SIZE + \beta_{10} TANG + \beta_{11} EarnVol + \beta_{12} RD + \beta_{13} NDTS + \gamma i + \varepsilon_{it}$$

$$(4)$$

where:

- *M*<sub>leveragei, t</sub> is the firm's market leverage ratio, which is a proxy for its capital structure.
- *B*<sub>leverageit</sub> Is the firm's book leverage, which is a second proxy for its capital structure.
- MNC × 2006 is an interaction variable equal to the crisis dummy for the year 2006.
- MNC × 2007 is an interaction variable equal to the crisis dummy for the year 2007.
- MNC\*Crisis<sub>2008</sub> is an interaction variable equal to the crisis dummy for the year 2008. This variable is
  used to compare the leverage ratios between MNCs and DCs in the year 2008, which is considered
  the mid-crisis period.
- MNC × 2009 is an interaction variable equal to the crisis dummy for the year 2009.
- MNC × 2010 is an interaction variable equal to the crisis dummy for the year 2010.
- MNC is a dummy variable equal to 1 if the firm is MNC and 0 if the firm is DC.
- *Profitability<sub>it</sub>*: is the firm's profitability in year *t*.
- *MB<sub>it</sub>* is the market-to-book ratio in year *t*.
- Size<sub>it</sub> is the firm's natural logarithm of total assets in year t.
- TANG<sub>it</sub> is the firm's asset tangibility in year t.

- *EarnVol*<sub>it</sub> is the firm's earnings volatility in year t.
- *RD<sub>it</sub>* is the firm's R&D in year *t*.
- *NDTS<sub>it</sub>* is the firm's NDTS in year *t*.
- γ<sub>i</sub> is the firm's unobservable effects.
- $\varepsilon_{it}$  is an error term.

#### 5. Empirical results

#### 5.1. Summary statistics

MNCs two samples (MNC10 and MNC25) and DCs' sample-related variables summary statistics over the years 2002–2019 are reported in Table 2. The descriptive statistics indicate that US MNCs have lower leverage levels than US DCs. MNC10 and MNC25 market leverage ( $M_{leverage}$ ) mean values were 0.207 and 0.216, respectively. Both MNC10 and MNC25 mean leverage were less than the corresponding value for the DC sample, at 0.300. Similarly, the median market leverage also shows lower market leverage for US MNCs than DCs (0.157 and 0.240, respectively). Consistent with the market leverage, MNCs' book leverage's mean and median values were lower than that of DCs'. Overall, the lower market and book leverage ratio for MNCs than for DCs is consistent with findings in previous studies comparing the capital structures of US MNCs and DCs (e.g., Alnori, 2021; Park et al., 2013).

Table 2 also provides summary statistics for the firm-related variables used in the regression analysis. These summarized statistics report that the mean and median profitability values were similar for US MNCs and DCs: 0.129 and 0.126 for MNC10, 0.124 and 0.121 for MNC25, and 0.128 and 0.126 for the DC sample.

MNCs also report slightly higher mean and median *MB* than DCs. More precisely, the mean values of *MB* were 1.846 and 1.811 for MNC10 and MNC25, respectively, whereas the corresponding mean value was 1.664 for DCs. Further, MNCs have lower tangible assets (*TANG*), as shown by the mean and median values. The mean and median values for *TANG* were respectively 0.423 and 0.370 for MNC10; 0.469 and 0.377 for MNC25; and 0.653 and 0.617 for DCs.

The descriptive statistics indicate that MNCs have a higher R&D investment (*RD*) than DCs. The two samples of MNCs had higher RD mean and median values than the domestic firms' sample. The mean and median values confirm that US MNCs have lower R&D intensity: mean and median *RD* were 0.049 and 0.029 for MNC10; 0.051 and 0.031 for MNC25; and 0.019 and 0 for DCs. Similarly, Table 2 shows that the NDTS is similar across US MNCs and DCs.

#### 5.2. Regression results

The regression results are summarized in Table 3. The first (second) column presents the fixed effects regression results for the model comparing the market (book) leverage ratios between MNCs based on 10% FTX (MNC10) and their domestic counterparts. Column 3(4) presents the fixed effects regression results comparing the market (book) leverage ratios for the MNC sample based on a 25% FTX (MNC25) with that of their domestic peers.

The coefficient for the interaction variable *MNC\*2006* is significantly negative at the 1% level and consistent in both MNC samples (MNC10 and MNC25). This empirical evidence confirms that MNCs had lower market and book leverage ratios than DCs in 2006, before the crisis. It indicates that during times of no financial shock (i.e., pre-crisis), MNCs have lower leverage ratios than DCs. This is consistent with the evidence in the literature for MNCs having lower leverage ratios than DCs and can be explained by MNCs' higher agency cost of debt, geographic diversification, and exchange rate risk (Burgman, 1996; Chen et al., 1997; Doukas & Pantzalis, 2003; Lee & Kwok, 1988).

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			MNO	10					MNC	25					-	X		
	z	Mean	Median	Std.de	Min	Μαχ	z	Mean	Median	Std.de	Min	Max	z	Mean	Median	Std.de	Min	Max
M <sub>leverage</sub>	11373	.207	.157	.203	0	.947	8564	.2165	.167	.206	0	.947	6754	.300	.244	.263	0	.947
Bleverage	11373	.227	.204	.197	0	2.381	8564	.233	.211	.196	0	2.12	6757	.306	.273	.270	0	4.37
Profitability	11369	.129	.125	670.	988	.437	8561	.124	.121	079.	988	.437	6743	.128	.126	.110	-1.69	.437
MB	11373	1.84	1.566	.956	.522	7.478	8564	1.81	1.54	.930	.522	7.41	6754	1.66	1.40	006.	.522	7.44
Size	11373	7.761	7.594	1.439	5.521	10.560	8564	7.783	7.61	1.45	5.52	10.56	6754	7.04	6.81	1.15	5.52	10.56
TANG	11357	.462	.370	.337	0	2.402	8551	.469	.377	.339	0	2.40	6706	.653	.617	.454	0	2.40
EarnVol	11070	.035	.023	.052	.003	1.840	8315	.036	.023	.055	0	1.84	6389	.047	.026	.130	.003	5.89
RD	7957	.049	.029	.054	0	.652	6076	.051	.031	.055	0	.652	2795	.019	0	.050	0	.579
NDTS	11369	.040	.035	.026	0	.320	8561	.041	.035	.026	0	.320	6743	.050	.042	.039	0	.320
TA (US\$M)	11373	10874.	1987.8	36597	250.0	797769	8564	11404.6	2019.2	38656	250	797769	6754	2903	914.2	7144.7	250.07	118534

The interaction variable *MNC\*2007*, which compares the capital structure of MNCs and DCs in 2007, shows that the difference between the market and book leverage ratios of MNCs and DCs is not significant. Several prior studies combine 2006 and 2007 and define them as the pre-crisis period (e.g., Iqbal & Kume, 2014). However, the present study shows that the investigation of each year (i.e., 2006 and 2007) separately to explore the effects of the crisis on firms' financing provides a more accurate picture of the different effects of each relevant year.

More importantly, in mid-crisis (i.e., in 2008), the sign of the variable *MNC\*Crisis<sub>2008</sub>* is positive and statistically significant. Both samples constructed for US MNCs (i.e., MNC10 and MNC25) have significantly higher market and book leverage ratios than their domestic counterparts in 2008. This shows the first empirical evidence indicating that multinational firms have higher leverage ratios in comparison to domestic firms during times of financial shock. This result supports the hypothesis that MNCs' lower expected bankruptcy, because of their international diversification and access to external capital markets, enables them to have higher leverage ratios than DCs during times of financial shock and credit constraint.

Prior studies showed that MNCs have lower leverage ratios than DCs and explained the lower leverage of MNCs to higher agency cost of debt (e.g., Akhtar, 2017; Burgman, 1996; Chen et al., 1997; Doukas & Pantzalis, 2003; Jones et al., 2020; Lee & Kwok, 1988; McMillan & Camara, 2012; Mittoo & Zhang, 2008; Park et al., 2013; Wang et al., 2020). These studies also reported that expected bankruptcy does not play an important role when comparing the capital structures of MNCs and DCs. However, the current study findings explored that bankruptcy cost, as introduced by the trade-off theory, is an important factor for MNCs' capital structure decisions under a financial shock event. Therefore, during the 2008-GFC, MNCs capital structure includes significantly more market and book leverage than DCs capital structure.

Concerning finance theory, the findings of this study indicate that the trade-off theory predicts that MNCs will be financed with higher leverage because they have lower expected bankruptcy costs than their domestic counterparts because of the diversification of their operations in different uncorrelated economies and their access to external capital markets. (e.g., Agmon & Lessard, 1977; Senbet, 1979; Shapiro, 1978). Likewise, the results indicate that MNCs' lower expected bankruptcy cost allows them to be highly leveraged compared with domestic firms during times of poor macroeconomic conditions. Consistent with the trade-off theory, this study shows that the lower expected bankruptcy of MNCs allows them to report higher leverage ratios than DCs in the GFC.

After the mid-crisis time, the difference in the leverage ratios between MNCs and DCs is insignificant. More specifically, the interaction variable  $MNC \times 2009$ , which compares the capital structures of MNCs and DCs in the year 2009, is not significant, suggesting that the difference in market and book leverage ratios between MNCs and DCs is not significant. This finding is consistent with Park et al. (2013).

Two years after the mid-crisis period, the comparison between MNCs' and DCs' leverage ratios reveals that MNCs' capital structures have begun to acquire significantly lower market and book leverage ratios than pure DCs. The sign of the interaction variable *MNC × 2010*, which compares the leverage ratios of MNCs and DCs in the post-crisis year 2010, is negative and statistically significant. This confirms that MNCs have lower leverage during times of good economic conditions than do DCs, consistent with prior studies in the field (e.g., Burgman, 1996; Chen et al., 1997; Doukas & Pantzalis, 2003; Lee & Kwok, 1988).

Overall, the regression analysis outcomes show that when there is no financial shock in the economy, the target capital structure for MNCs includes lower debt in comparison with DCs, due to factors identified in prior studies, which include the agency cost and exchange rate risk (see Burgman, 1996; Doukas & Pantzalis, 2003; Lee & Kwok, 1988). However, in periods of financial

# Table 3. Regression results comparing the leverage level between MNCs and DCs during the GFC

Regression results compare the leverage ratio of US MNCs and DCs before, during, and after the GFC, including the years 2006–10. The table presents regression results for the samples of MNCs (i.e., MNC10 and MNC25) and DCs over the period 2002–14. The dependent variables in the regressions are *Mleverage* and *Bleverage*. The interaction variable *MNC\*Crisis<sub>2008</sub>* is used to compare the leverage ratio between MNCs and DCs during the crisis. The other interaction variables (*MNC\*2006, MNC\*2007, MNC\*2008, MNC\*2009,* and *MNC\*2010*) compare the leverage ratios between MNCs and DCs in each relevant year. *MNC10 (MNC25)* is an indicator variable equal to 1 when a firm's FTX in a given year is at least 10% (25%) of its total tax and 0 otherwise. The control variables are *profitability, MB, size, TANG, EarnVol, RD,* and *NDTS.* The definitions for the mentioned control variables are provided in Appendix Table 1. The numbers in parentheses are robust standard errors; \*.\*\*. and \*\*\* represent two-tailed significance at the 10%, 5%, and 1% levels, respectively.

Variables	(1) (FE) MNC10 sample	(2) (FE) MNC10 sample Blavarage	(3) (FE) MNC25 sample	(4) (FE) MNC25 sample Bloverage
MNC*2006	-0.0094**	-0.0093**	-0.0115**	-0.131**
	(0.0036)	(0.0044)	(0.00458)	(0.004)
MNC*2007	-0.00173	-0.004	-0.006	-0.007
	(0.00433)	(0.0045)	(0.005)	(0.005)
MNC*Crisis <sub>2008</sub>	0.0609***	0.0124**	0.027***	0.011**
	(0.00641)	(0.00521)	(0.008)	(0.005)
MNC*2009	-0.00081	-0.0124**	0.003	-0.0120**
	(0.00460)	(0.00468)	(0.005)	(0.0054)
MNC*2010	-0.0139***	-0.0154***	-0.017***	-0.0161***
	(0.00387)	(0.00351)	(0.004)	(0.004)
MNC	-0.0058	0.0089	-0.005	-0.006
	(0.0157)	(0.0176)	(0.021)	(0.018)
Profitability	-0.504***	-0.326***	-0.496***	-0.293***
	(0.053)	(0.0577)	(0.059)	(0.065)
МВ	-0.0353***	0.0021	-0.041***	-0.001
	(0.0039)	(0.0040)	(0.004)	(0.004)
Size	0.0372***	0.0334***	0.038***	0.033***
	(0.006)	(0.0067)	(0.006)	(0.0075)
TANG	0.065**	-0.0083	0.080**	0.016
	(0.0271)	(0.0067)	(0.03)	(0.027)
EarnVol	0.035	-0.036	0.029	-0.077
	(0.0489)	(0.0364)	(0.053)	(0.063)
RD	-0.0931	-0.212**	-0.099	-0.202*
	(0.0789)	(0.10)	(0.09)	(0.112)
NDTS	0.769***	0.741***	0.680***	0.605***
	(0.186)	(0.207)	(0.190)	(0.203)
Constant	-0.0114	-0.028	-0.004	-0.002
	(0.0513)	(0.0561)	(0.059)	(0.061)
Observations	10456	10456	8603	8603
Number of firms	1930	1930	1761	1761
R-squared	0.20	0.05	0.205	0.05

shock and credit constraint, the target leverage ratios of MNCs include more debt compared with DCs because of the lower expected bankruptcy cost for MNCs, as reported in classical international finance studies (e.g., Agmon & Lessard, 1977; Senbet, 1979; Shapiro, 1978).

Regarding the control variables in the regression, firms' profitability is negatively related to the market and book leverage and is significant at 1% for both MNC samples (i.e., MNC10 and MNC25). This is consistent with the pecking order theory, which predicts that higher profitability firms should be less leveraged because profitable firms have sufficient internal funds. Findings depicting a negative relationship between a firm's profitably and leverage is consistent with prior studies (e.g., Burgman, 1996; Chen et al., 1997; Doukas & Pantzalis, 2003; Frank & Goyal, 2003, 2009; Lemmon et al., 2008; McMillan & Camara, 2012; Mittoo & Zhang, 2008; Park et al., 2013; Rajan & Zingales, 1995).

*MB*, which is used as a proxy for future investment opportunities, is negative and significantly related to market leverage, although this variable is not significantly related to book leverage. These relationships between firms' future opportunities and leverage are similar in the two samples constructed for MNCs (MNC10 and MNC25). The finding of a relationship between market leverage and *MB* is consistent with Myers's (1997) underinvestment agency debt problems, which predicts that firms with higher future investment opportunities will have lower debt. The negative relationship between firms' future opportunities and leverage is in line with prior studies (Chen et al., 1997; Doukas & Pantzalis, 2003; Frank & Goyal, 2009; Mittoo & Zhang, 2008; Park et al., 2013).

MNC10 and MNC25 show that firm size is positively and significantly related to firms' market and book leverage at 1% significance. These results are consistent with the trade-off theory, which predicts that the larger the firm, the better able they are to be financed with more debt because of the lower expected bankruptcy for large firms and because they are well-known in financial markets. However, the present finding of a positive relationship between firm size and leverage is inconsistent with the pecking order theory, which predicts a negative relationship between firms' size and leverage. The finding of a relationship between firm size and leverage is in line with prior studies (e.g., Alnori, 2021; Park et al., 2013; Rajan & Zingales, 1995).

Assets tangibility (TANG) is positively related to firms' market leverage but not significantly to book leverage. The positive relationship between firms' asset tangibility and market leverage is consistent with the trade-off theory, which assumes that firms with more asset tangibility use more debt to gain tax shield advantages because they can use their assets as collateral (Jerbeen & Alnori, 2020).

US MNCs' and DCs' *RD* is not significantly related to their market leverage. However, *RD* is negatively related to book leverage, consistent with Park et al. (2013). The significant negative relationship is inconsistent with Titman (1984), who argues that firms with higher research and development investment have a higher expected bankruptcy cost and consequently should be less leveraged.

The results show that NDTS is positively and significantly related to firms' capital structure decisions. This suggests that depreciation expenses do not substitute for firm leverage, which is inconsistent with DeAngelo and Masulis (1980). However, the positive relationship between NDTS and the leverage of MNCs is in line with Harris and Raviv (1991) who state that NDTS should increase leverage.

#### 6. Robustness

Robustness tests were executed to ensure whether MNCs report significantly higher leverage ratios than DCs in the GFC. MNCs' higher market and book leverage ratios compared with DCs in the GFC

remain unchanged after using a different total assets cut-off, applying two alternative classifications for US MNCs, and applying an alternative methodology.

#### 6.1. Alternative total assets cut-off

As mentioned, the main sample used in the present study is based on a US\$250 million total assets cut-off. However, some studies apply alternative total assets cut-offs; for example, Park et al. (2013) applied a US\$1 billion total assets cut-off to study the capital structures of MNCs and DCs. Therefore, following Park et al. (2013) and for robustness checks, the current study repeated the analysis by including MNCs and DCs with at least US\$1 billion in total assets. The results reported in

Table 4. Regression results comparing the leverage level between MNCs and DCs during the GFC

Leverage regression comparing the leverage ratio of US MNCs and DCs before, during, and after the GFC, for the period 2006–10 after constructing a sample based on a US\$1 billion total assets cut-off.

Variables	(1) MNC10 sample M <sub>leverage</sub>	(2) MNC10 sample B <sub>leverage</sub>	(3) MNC25 sample M <sub>leverage</sub>	(4) MNC25 sample B <sub>leverage</sub>
MNC*2006	-0.0115**	-0.0119**	-0.0107**	-0.0123**
	(0.00428)	(0.00518)	(0.00515)	(0.00502)
MNC*2007	-0.00105	-0.00802*	-0.00132	-0.00672
	(0.00521)	(0.00462)	(0.00614)	(0.00526)
MNC*Crisis <sub>2008</sub>	0.0595***	0.0115**	0.0641***	0.0140**
	(0.00751)	(0.00568)	(0.00839)	(0.00594)
MNC*2009	-0.00163	-0.0164**	0.000920	-0.0135**
	(0.00504)	(0.00500)	(0.00606)	(0.00563)
MNC*2010	-0.0139***	-0.0120**	-0.0169***	-0.0134**
	(0.00387)	(0.00391)	(0.00456)	(0.00449)
MNC	-0.0177	0.0132	-0.0241	-0.0242
	(0.0290)	(0.0412)	(0.0429)	(0.0502)
Profitability	-0.586***	-0.408***	-0.572***	-0.371***
	(0.103)	(0.0467)	(0.117)	(0.0515)
MB	-0.0427***	7.97e-06	-0.0521***	-0.00331
	(0.00662)	(0.00472)	(0.00804)	(0.00381)
Size	0.0290***	0.0312***	0.0288**	0.0285**
	(0.00842)	(0.00851)	(0.00973)	(0.00982)
TANG	0.0760*	-0.0117	0.0950**	-0.00740
	(0.0393)	(0.0302)	(0.0475)	(0.0327)
EarnVol	0.180	-0.134	0.215	-0.168
	(0.148)	(0.104)	(0.174)	(0.118)
RD	-0.00685	-0.176	0.0258	-0.111
	(0.106)	(0.133)	(0.128)	(0.148)
NDTS	0.601*	0.588*	0.467	0.464
	(0.318)	(0.317)	(0.353)	(0.293)
Constant	0.0842	0.0210	0.107	0.0827
	(0.0824)	(0.0867)	(0.0960)	(0.0926)
Observations	6,240	6,240	5,066	5,066
R-squared	0.221	0.063	0.227	0.058

Table 4 confirm that US MNCs have significantly higher leverage ratios than their domestic peers in the mid-crisis period (i.e., 2008).

#### 6.2. Alternative MNC classifications

#### 6.2.1. Foreign pre-tax income

The current study applied FTX to classify US MNCs. However, several studies use other measures to classify US MNCs, including foreign pre-tax income. Chen et al. (1997) report that foreign pre-tax income is an appropriate identifier for firms' international activities because this measure considers both the revenue and expenses from MNC operations. Therefore, and for robustness purposes, the current study repeats the analysis, applying foreign pre-tax income to classify US MNCs. Following Chen et al. (1997), firms that report more than a 10% foreign pre-tax income ratio are classified as MNCs, whereas firms without foreign pre-income tax are considered DCs.

Table 5 summarizes the results of the comparison between MNC and DC leverage levels during the mid-crisis after applying foreign pre-tax income to classify MNCs. In this analysis, the current study applies both the US\$1 billion total assets cut-off (i.e., columns 1 and 2) and the US\$250 million total assets cut-off (i.e. columns 3 and 4). Similar to the results reported in the main analysis (see Table 3), the results in Table 5 confirm that US MNCs, on average, have higher market and book leverage than DCs during the GFC.

#### 6.2.2. Foreign sales ratio

The foreign sales ratio (FSR) is often used in literature to classify MNCs (e.g., Alnori, 2021; Fernandes & Gonenc, 2016; Park et al., 2013). Following these studies and for robustness, the current study repeated the regression analysis after classifying MNCs based on foreign sales. In doing so, the current study follows Alnori (2021) and Park et al. (2013) and constructed two samples representing MNCs based on FSRs of 20% (i.e., FSR20) and 50% (FSR50). More specifically, In the first sample (FSR20), firms that report at least 20% FSRs are classified as MNCs, while firms that report zero foreign sales are considered DCs. In the second sample (FSR50), firms that report at least 50% of foreign sales among their total sales are classified as MNCs, while firms that report zero foreign sales are DCs.

Table 6 reports the regression analysis results comparing the leverage levels between MNCs and DCs in 2008 (mid-crisis), after applying the FSR to classify MNCs based on a US\$250 million total assets cutoff. Consistent with the results reported in the main analysis (see Table 3), the results in Table 6 confirm that US MNCs, on average, have higher market and book leverage than DCs during the GFC. Finally, the current study also applied OLS regression for robustness purposes and drew a similar conclusion. However, to save space, the results are not reported. They are available upon request.

### 7. Conclusion

Previous studies hypothesize that multinational firms' lower leverage arises from high agency cost due to the complexity of the international environment and the exchange rate risk (Akhtar, 2017; Alnori, 2021; Burgman, 1996; Doukas & Pantzalis, 2003; Jones et al., 2020; Lee & Kwok, 1988; McMillan & Camara, 2012; Mittoo & Zhang, 2008; Park et al., 2013; Wang et al., 2020). In comparison to the trade-off theory, prior studies reported that the agency theory is better able to explain the lower leverage of MNCs than the trade-off theory expected bankruptcy.

To date, the comparison between MNCs and DCs capital structure during times of financial shock and credit constraint has not been empirically investigated. The current study argues that MNCs lower expected bankruptcy, due to their international diversification of operations and ability to access foreign capital markets, is an important and relevant factor in MNC and DC capital structure decisions. To confirm this view, the current study focused on the 2008-GFC to compare the

# Table 5. Regression results comparing the leverage level between MNCs and DCs using an alternative classification for MNCs (foreign Pre-tax Income)

Leverage regression comparing the leverage ratio of US MNCs and DCs before, during and after the GFC, which includes the period 2006–10, after applying foreign pre-tax income to classify MNCs.

Variables	(1) US\$1B cut-off M <sub>leverage</sub>	(2) US\$1B cut-off B <sub>leverage</sub>	(3) US\$250M cut-off M <sub>leverage</sub>	(4) US\$250M cut-off B <sub>leverage</sub>
MNC*2006	-0.0146***	-0.0145***	-0.0119***	-0.0119**
	(0.00382)	(0.00423)	(0.00333)	(0.00388)
MNC*2007	-0.00422	-0.00636	0.000478	-0.00350
	(0.00457)	(0.00469)	(0.00393)	(0.00434)
MNC*Crisis <sub>2008</sub>	0.0560***	0.0165**	0.0620***	0.0202***
	(0.00657)	(0.00556)	(0.00574)	(0.00511)
MNC*2009	-0.00384	-0.0116**	-0.00112	-0.00985**
	(0.00471)	(0.00507)	(0.00414)	(0.00434)
MNC*2010	-0.0137***	-0.0120**	-0.00977**	-0.0120**
	(0.00380)	(0.00394)	(0.00338)	(0.00383)
MNC	-0.0174	-0.00426	-0.0154*	-0.00847
	(0.0131)	(0.0120)	(0.00792)	(0.00848)
Profitability	-0.576***	-0.350***	-0.501***	-0.332***
	(0.0791)	(0.0510)	(0.0434)	(0.0479)
MB	-0.0410***	-0.00220	-0.0337***	0.00173
	(0.00548)	(0.00495)	(0.00340)	(0.00403)
Size	0.0365***	0.0412***	0.0399***	0.0406***
	(0.00728)	(0.00787)	(0.00526)	(0.00607)
TANG	0.101**	0.0331	0.0709**	0.0298
	(0.0344)	(0.0296)	(0.0241)	(0.0235)
EarnVol	0.0668	-0.141*	0.00587	-0.0438
	(0.111)	(0.0796)	(0.0439)	(0.0633)
RD	-0.0866	-0.244**	-0.158**	-0.225**
	(0.100)	(0.124)	(0.0737)	(0.0940)
NDTS	0.403*	0.145	0.629***	0.527**
	(0.243)	(0.226)	(0.152)	(0.204)
Constant	0.0171	-0.0545	-0.0232	-0.0706
	(0.0681)	(0.0766)	(0.0441)	(0.0515)
Observations	7,548	7,548	12,678	12,678
R-squared	0.217	0.062	0.202	0.058
Number of firms	1,175	1,175	2,062	2,062

leverage levels between MNCs and DCs and to investigate the important role of bankruptcy cost in times of credit constraint and high default risk.

Unlike previous studies, which report that US MNCs' capital structures show low leverage ratios compared with their domestic counterparts, this study explores that MNCs' capital structures include significantly higher leverage levels than DCs in times of credit constraint and high default risk, such as the GFC. This higher leverage of MNCs is explained by the trade-off theory's lower expected bankruptcy cost. This finding reveals that bankruptcy cost is important and relevant to

# Table 6. Regression results comparing the leverage levels between MNCs and DCs Using an alternative classification for MNCs (Foreign Pre-tax Income)

Leverage regression comparing the leverage ratio of US MNCs and DCs before, during and after the GFC, which covers the period 2006–10, after applying foreign sales to classify MNCs. The table presents regression results for MNCs two samples (i.e. FSR20 and FSR50) and DCs over the period 2002–2019.

Variables	(1) (FE) FSR20% sample Mieverage	(2) (FE) FSR20% sample Bioverage	(3) (FE) FSR50% sample Mieverage	(4) (FE) FSR50% sample Bioverage
MNC*2006	-0.015***	-0.013**	-0.005	-0.006
	(0.00)	(0.01)	(0.01)	(0.01)
MNC*2007	-0.006	-0.007	-0.003	-0.006
	(0.01)	(0.01)	(0.01)	(0.01)
MNC*Crisis <sub>2008</sub>	0.069***	0.013**	0.082***	0.023***
	(0.01)	(0.01)	(0.01)	(0.01)
MNC*2009	-0.001	-0.019***	0.006	-0.011
	(0.00)	(0.00)	(0.01)	(0.01)
MNC*2010	-0.019***	-0.023***	-0.019***	-0.021***
	(0.00)	(0.00)	(0.01)	(0.01)
MNC	-0.017	-0.025	-0.061**	-0.074**
	(0.02)	(0.02)	(0.03)	(0.03)
Profitability	-0.337***	-0.262***	-0.265***	-0.235***
	(0.04)	(0.05)	(0.05)	(0.05)
MB	-0.027***	-0.002	-0.030***	-0.003
	(0.00)	(0.00)	(0.00)	(0.00)
Size	0.031***	0.029***	0.044***	0.038***
	(0.01)	(0.01)	(0.01)	(0.01)
TANG	0.031	0.008	0.011	0.009
	(0.03)	(0.03)	(0.03)	(0.04)
EarnVol	0.101*	0.069	0.132*	0.071
	(0.06)	(0.07)	(0.08)	(0.10)
RD	-0.195**	-0.299*	-0.140	-0.298
	(0.09)	(0.16)	(0.09)	(0.21)
NDTS	0.461**	0.114	0.563**	0.048
	(0.20)	(0.33)	(0.24)	(0.36)
Constant	0.035	0.063	-0.044	0.022
	(0.05)	(0.07)	(0.07)	(0.08)
Observations	7,412	7,412	4,522	4,522
Number of firms	1,046	1,046	759	759
R-squared	0.18	0.05	0.19	0.06

MNCs' and DCs' capital structure choices, as suggested by classical studies (e.g., Agmon & Lessard, 1977; Park et al., 2013; Senbet, 1979; Shapiro, 1978).

Besides the agency theory, this study shows how expected bankruptcy under the trade-off theory remains empirically useful when comparing leverage levels between MNCs and DCs. More specifically, in times of good economic conditions, where there is no credit constraint and no financial shock, the

target capital structure for MNCs includes lower debt than that for DCs because of the high agency cost of MNCs, which is consistent with prior studies (Burgman, 1996; Doukas & Pantzalis, 2003; Jones et al., 2020; Lee & Kwok, 1988; Mittoo & Zhang, 2008; Park et al., 2013; Wang et al., 2020). In contrast, during periods of financial shock and credit constraint, the target leverage ratios for MNCs include more debt than those for DCs because of MNCs' lower expected bankruptcy cost.

The findings of this study provide important implications. Policymakers and managers should know multinational firms' ability to deal with market imperfection during financial shocks. Further, the findings of this study inform multinational firms' managers on MNCs' variety of financing than DCs during a financial shock. Finally, researchers should be aware that MNCs lower expected bankruptcy still plays an important role in MNCs' financing decisions.

#### Author details

#### Faisal Alnori<sup>1</sup>

E-mail: falnore@kau.edu.sa

<sup>1</sup> King Abdulaziz University, Department of Finance, Faculty of Economics and Administration, Jeddah, Saudi Arabia.

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#### Notes

- 1. As mentioned, beside the market leverage measure of capital structure, the study also includes (the book leverage) to ensure that the results are not influenced by the large drop in the equity prices (i.e., mechanical effect) during the 2008-GFC.
- 2. The current study also performed the generalized method of moment (GMM) procedure developed by Arellano and Bond (1991) and Arellano and Bover (1995). However, the serial correlation tests and the Sargan test of overidentifying restrictions are rejected at the 1% significant level. Thus, GMM method cannot applied.

#### **Disclosure statement**

No potential conflict of interest was reported by the author.

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### Appendices

### Appendix A1. Description of Applied Variables

All firm data are obtained from Compustat.

Multinational activities	
FTX	foreign tax/total tax
MNC10	a dummy variable that equals 1 if the FTX is at least 10% and 0 otherwise
MNC25	a dummy variable that equals 1 if the FTX is at least 25% and 0 otherwise
FSR20	MNCs that report at least 20% foreign sales ratio (FSR)
FSR50	MNCs that report at least 50% FSR
Capital structure variables	
M <sub>leverage</sub>	(long -term book debt + short-term debt)/ (long-term debt short-term book debt + stock price * number of outstanding shares)
B <sub>leverage</sub>	(long-term book debt + short-term debt)/total assets
Financial crisis variables	
Crisis2008	a dummy variable that equals 1 if the year is 2008 and 0 if not
MNC*Crisis2008	Crisis 2008 dummy multiplied by the MNC dummy
Pre-crisis variables	
Pre-Crisis2006	a dummy variable that equals 1 if the year is 2006 and 0 if not
Pre-Crisis2007	a dummy variable that equals 1 if the year is 2007 and 0 if not
MNC*Pre-Crisis2006	pre-Crisis2006 dummy multiplied by the MNC dummy
MNC*Pre-Crisis2007	pre-Crisis2007 dummy multiplied by the MNC dummy
Post-crisis variables	
Post-Crisis2009	a dummy variable that equals 1 if the year is 2009 and 0 if not
Post-Crisis2010	a dummy variable that equals 1 if the year is 2010 and 0 if not
MNC*Post-Crisis2009	post-Crisis2009 dummy multiplied by the MNC dummy
MNC*Post-Crisis2010	post-Crisis2010 dummy multiplied by the MNC dummy
Firm characteristic variables	
Profitability	ratio of EBITDA to total assets
МВ	(total assets—book equity + market value of equity)/total assets
Size	natural logarithm of total assets
TANG	ratio of property, plant, and equipment to total book assets
RD	R&D investment/total assets
EarnVol	standard deviation of EBIT to total assets over the most recent 3 years
NDTS	ratio of depreciation and amortization to total assets
	1