

# “Testing pecking order behaviors from the viewpoint of multinational and domestic corporations”

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## Testing pecking order behaviors from the viewpoint of multinational and domestic corporations

### Abstract

This study is the first to investigate the well-known pecking order behaviors from the viewpoint of internationalization. This study's results show that the financing behaviors of the US firms are consistent with the pecking order theory to some extent. In addition, the pecking order theory applies more to multinational corporations (MNCs) than domestic corporations (DCs). The results from curvilinear regression models demonstrate a concave relationship between net debt issues and financing deficits for both MNCs and DCs, indicating that firms finance their deficits with debts first and issue equities only when they reach their debt capacity. Still, the pecking order effects are larger for MNCs than DCs.

**Keywords:** pecking order theory, internationalization, curvilinear regression model.

**JEL Classification:** F23, G32.

### Introduction

The pecking order theory (Myers, 1984; Myers and Majluf, 1984) is one of the most well-known theories of a firm's capital structure. The theory describes a hierarchy of financing choices that a firm makes due to information asymmetry. The pecking order theory posits that managers prefer internal financing to external financing, and if internal funds are inadequate, debt financing is preferred to equity financing.

Shyam-Sunder and Myers (1999) was the first study to test the pecking order theory. The authors' idea was that debt financing is used to fill the internal financing gap, which is constructed from aggregating dividends, investment and change in working capital minus internal cash flows. They found strong support for the pecking order theory among a sample of 157 firms that had traded continuously during the period from 1971 to 1989. Using the same idea and model, some studies that followed have provided mixed evidence of this view. Frank and Goyal (2003) analyzed US listed companies from 1971 to 1998 but did not find support for the pecking order theory, especially for small, high-growth firms. Ngugi (2008) used 22 firms operating in Kenya from 1991 to 1999 to test the pecking order theory. They found better support for the pecking order than the trade-off theory when a J-test is applied. Ni and Yu (2008) used companies listed in China in 2004, and their results showed that only the large companies in the sample followed a pecking order, whereas small- and medium-sized companies did not. Lin, Hu and Chen (2008) used Taiwan listed firms and found that managerial

optimism could induce the pecking order preference. Seifert and Gonenc (2008) tested how well the pecking order theory applied to firms in the US, the UK, German and Japan. Results gave evidence for Japanese firms but little support for the US, the UK, and German firms. Seifert and Gonenc (2010) found little support for the pecking order theory in 23 emerging countries. Lemmon and Zender (2010) demonstrated a concave relationship between change in debt and financing deficits, and solved a problem raised by Chirinko and Singha (2000) that firms may be constrained by concerns over debt capacity. Bulan and Yan (2010) demonstrated that the pecking order theory described the financing behavior of mature firms better than growth firms.

The issue of investigating pecking order behavior from the viewpoint of internationalization has always been ignored despite the fact that many US firms have expanded their operations abroad substantially. Firms may choose to diversify internationally for many reasons, including increasing profits and creating market share. International firms generally have several geographical segments located in different reporting jurisdictions. Kogut (1983) argued that geographic diversification increases the operational flexibility of multinational corporations (MNCs) and allows firms to increase value by exploiting the additional uncertainty of the international environment. On the other hand, by running a global firm, MNC managers may also derive private benefits, including prestige or better career prospects, higher pay, and opportunities for entrenchment as they become more valuable to a more complex firm (Reeb, Mansi and Allee, 2001). From an information perspective, international diversification may increase information-processing costs due to stakeholders' unfamiliarity with international operating environments, among other factors (Goldberg and Heflin, 1995; Reeb, Kwok and Baek, 1998; Duru and Reeb, 2002). Wright, Madura and Wiant (2002) and Doukas and Pantzalis (2003) attribute higher agency costs in MNCs to the higher level of

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information asymmetry that arises when MNCs diversify geographically. Duru and Reeb (2002) found that analysts' forecasts became less accurate as operations became more diversified geographically, which is consistent with the presence of a more significant level of information asymmetry between MNCs and the analysts. Chiang and Ko (2009) provided evidence that lower frequencies of consolidated financial statements also increased information asymmetries, particularly for MNCs.

Internationally diversified firms create a more complex information environment, and investors generally are more informed about a firm's domestic operations than about its foreign operations. Precisely because information is asymmetrical, external financing is more costly than internal free cash flows of investments. Alternatively, more information could be available for MNCs, because they are usually larger than domestic firms. Lee, Mande and Son (2008) demonstrated that MNCs released their earnings reports earlier than domestic corporations (DCs). Other literature, such as Gray, Meek and Roberts (1995), Hossain, Perera and Rahman (1995), Khanna, Palepu and Srinivasan (2004), and Cahan, Rahman and Perera (2005) provided evidence that the level of voluntary disclosure is positively related to a company's extent of global operations and reduces information problems. Thus, it is not clear if information asymmetry problems are so severe among MNCs and thus have some impact on a firm's financing policies such as pecking order behavior. To date, the corresponding tests have not yet been explored.

The international expansion of firms provides an interesting setting to explore the impact on pecking order behaviors. In this study, we divide firms into MNCs and DCs to compare how well the pecking order theory applies to these two types of firms. We also use the curvilinear regression model to examine a possible non-linear relationship based on a misleading inference to the simple linear test of Shyam-Sunder and Myers (1999), a comment made by Chirinko and Singha (2000). To our best knowledge, no studies to date have focused on comparing MNCs and DCs when testing the pecking order theory. Therefore, the purpose of the present study is to fill a gap in the literature by investigating the pecking order and internationalization.

The present study demonstrates that the financing behaviors of the US firms are consistent with the pecking order theory to some extent, and the pecking order theory applies better to the financial behavior of MNCs than to DCs. This result remains robust even when we control for important factors related to leverage such as tangibility, growth opportunities, firm size, and profitability as suggested by Rajan and Zingales (1995) and Frank and Goyal

(2003). Results from the curvilinear regression model demonstrate a concave relationship between net debt issues and financing deficits for both MNCs and DCs, indicating that firms finance their deficits with debts first and issue equities only when they reach their debt capacity. Still, the pecking order effects are higher for MNCs than DCs. Our results shed light on how internationalization influences pecking order behaviors and improves our understanding of firms' financing policies when they expand internationally.

The present study is structured as follows. Section 1 describes the data and variables. Section 2 provides the methodology, followed by empirical results and discussion in section 3. The final section concludes the paper.

## 1. Data and variables

The data consist of all US firms in the *Compustat* databases for the period of 1991-2009<sup>1</sup>. We exclude financial firms (Standard Industrial Classification [SIC] codes 6000-6999) and utilities (SIC codes 4900-4999) to avoid the fact that their capital structures are regulated. In line with previous capital structure studies, all variables are winsorized at their upper and lower 0.5% to mitigate the impact of outliers.

Following Lee (1986), Lee and Kwok (1988), and Burgman (1996), the present study mainly uses the foreign tax ratio (*FTTT*) to measure internationalization<sup>2</sup>. This variable is available directly from *Compustat* and allows the largest sample to be constructed. Firms are classified as purely DCs if their foreign tax ratio equals zero. Likewise, MNCs are defined as firms whose foreign tax ratios are greater than 10%. For comparison and robustness, we also use the foreign pre-tax income (*FITI*) as the other proxy for a company's degree of international involvement<sup>3</sup>.

Using the flow of funds data, we follow Frank and Goyal (2003) and calculate financing deficit (*DEF*) as the sum of cash dividends, investments and the change in working capital minus internal cash flow. The present study's dependent variable, net debt issued ( $\Delta D$ ), is defined as long-term debt issuance minus long-term debt redemption.

Following Rajan and Zingales (1995) and Frank and Goyal (2003), we use four important variables related to firm leverage as control variables: tangibility, growth opportunity, firm size and profitability. All variables are formally defined formally in the Appendix.

<sup>1</sup> We begin from 1991 because the data for the variable "foreign tax ratio" (*FTTT*), a proxy of internationalization, is not available prior to 1991 in the *Compustat* database.

<sup>2</sup> The foreign sales ratio and foreign assets ratio are the other two popular proxies as the degree of internationalization. The data are available from 2003 and the results are similar to use the foreign tax ratio or the foreign pre-tax income as internationalization proxies. Hence, we do not present the results to save space but they are available upon request.

<sup>3</sup> These data are available from 2001 on the *Compustat* database.

Tangible assets generally serve as collateral and thus have lower information asymmetry than intangible assets. Firms with higher tangible assets can borrow on relatively more favorable terms than firms with higher intangible assets, and the former are expected to have higher leverage ratios. In relation to MNCs and DCs, it is uncertain whether the level of tangible assets is higher or lower for MNCs relative to DCs. In this study, *Tangibility* (T) is defined as the ratio of fixed assets to total assets.

The value of future growth opportunities can be created by exploiting imperfections in product, factor, or capital markets. Firms with more growth options are expected to have higher information asymmetries and are expected to have higher leverage ratios. In relation to MNCs and DCs, MNCs tend to be in a more favorable position than DCs to take advantage of market imperfections and have higher growth opportunities than DCs (Bodnar and Weintrop, 1997). *Market-to-book ratio* (Q) is defined as the ratio of the market value of assets (defined as the book value of assets plus the difference between the market value of equity and the book value of equity) to the book value of assets.

Large firms have greater levels of diversification and lower business risks. Large firms, therefore, are expected to have more leverage because they face lower information costs when borrowing. In relation to MNCs and DCs, MNCs tend to be larger than DCs and have more leverage than DCs. *Firm size* (LS) is defined as the natural logarithm of total sales.

Finally, profitable firms can generate more internal funds. In relation to MNCs and DCs, MNCs have better opportunities than DCs to earn more profits mainly based on their access to more than one source of earnings and better chances for favorable business conditions in particular countries (Kogut, 1985; Barlett and Ghoshal, 1989). Consequently, MNCs are expected to be more profitable than DCs and have relative lower leverages than DCs. *Profitability* (P) is defined as the ratio of operating income to the book value of assets.

## 2. Methodology

**2.1. The simple model.** As a benchmark, we apply Shyam-Sunder and Myers's (1999) methodology for the pecking order hypothesis and test it through a regression of the net debt issued ( $\Delta D_{it}$ ) on financing deficits ( $DEF_{it}$ ). Standard errors are corrected for autocorrelation and heteroscedasticity using the Newey-West method.

$$\Delta D_{it} = \alpha + \beta_1 DEF_{it} + \varepsilon_{it}, \quad (1)$$

where  $DEF$  and  $\Delta D$  are scaled by net assets as in Frank and Goyal (2003). The slope coefficient,  $\beta_1$ ,

indicates the extent to which new debt issues are explained by financing deficits. Financial deficits should have a dollar-for-dollar impact on a firm's leverage if the pecking order is strictly followed. Specifically, if a firm follows the pecking order strictly, the estimated slope coefficient should be equal to one.

Next, we add some information sets to account for firm leverages, such as tangibility, market-to-book ratio, firm size, and profitability:

$$\Delta D_{it} = \alpha + \beta_1 DEF_{it} + \theta' X_{it} + \varepsilon_{it}, \quad (2)$$

$$\theta = (\beta_T, \beta_Q, \beta_{LS}, \beta_P)',$$

$$X_{it} = (\Delta T_{it}, \Delta Q_{it}, \Delta LS_{it}, \Delta P_{it})',$$

where  $X$  is the conventional set of explanatory variables proposed in the earlier literature for additional controls of leverage.  $X$  includes  $\Delta T$ ,  $\Delta Q$ ,  $\Delta LS$  and  $\Delta P$ , where  $T$  is the tangible asset ratio,  $Q$  is the market-to-book ratio,  $LS$  is the firm size, and  $P$  is the firm profitability. Because the dependent variable is the net debt issued, we follow Frank and Goyal (2003) and take these variables in their first differences.

As noted, the main purpose of the present study is to test the pecking order from the viewpoint of internationalization. After classifying firms as MNCs or DCs, we introduce a dummy variable for internationalization and run the following regression on the entire sample:

$$\Delta D_{it} = \alpha + \beta_1 DEF_{it} + \beta_2 M_{it} + \beta_3 DEF * M_{it} + \theta' X_{it} + \varepsilon_{it}, \quad (3)$$

where  $M_{it}$  is a dummy variable (i.e., two internationalization measures,  $FTTT$  and  $FITI$ , as described in *Data and Variables*), which is 0 if the firm is classified as a DC and 1 if classified as an MNC. Then, the interactive variables are introduced to ascertain whether the pecking order effect is significantly different between MNCs and DCs.

When  $M_{it} = 1$

$$\begin{aligned} \Delta D_{it} &= \alpha + \beta_1 DEF_{it} + \beta_2 M_{it} + \beta_3 DEF_{it} * M_{it} + \theta' X_{it} + \varepsilon_{it} \\ &= \alpha + \beta_1 DEF_{it} + \beta_2 + \beta_3 DEF_{it} + \theta' X_{it} + \varepsilon_{it} \\ &= (\alpha + \beta_2) + (\beta_1 + \beta_3) DEF_{it} + \theta' X_{it} + \varepsilon_{it}. \end{aligned}$$

When  $M_{it} = 0$

$$\begin{aligned} \Delta D_{it} &= \alpha + \beta_1 DEF_{it} + \beta_2 M_{it} + \beta_3 DEF_{it} * M_{it} + \theta' X_{it} + \varepsilon_{it} \\ &= \alpha + \beta_1 DEF_{it} + \theta' X_{it} + \varepsilon_{it}. \end{aligned}$$

The coefficient  $\beta_1$  represents the net-debt-issue/financing-deficit sensitivities of DCs, and the coefficients  $\beta_1 + \beta_3$  represents the sensitivities of MNCs. If  $\beta_3$  is significant, then the pecking order behaviors will differ between MNCs and DCs. In this situation, we divide firms in the sample into MNCs and DCs and use equation (2) to test the pecking order theory again and then compare the results.

We argue that information asymmetries and agency problems that exist at a domestic level are likely to exacerbate when firms diversify internationally, and that the pecking-order coefficient,  $\beta_1$ , of MNCs will be greater than that of DCs, despite the fact that some MNCs may voluntarily disclose and release their earnings reports earlier than DCs. Specifically, MNCs operate in a relatively more complex environment than DCs, and those who invest in MNCs are confronted with increased information gaps and higher costs of investigation due to auditing costs, language differences, sovereignty uncertainties and differing legal and accounting systems. In addition, MNCs are likely to be exposed to additional risks such as political contingencies and exchange rate risks compared to DCs. Higher cash flow uncertainties and agency costs always result in high information asymmetry and induce MNCs to follow the pecking order more than DCs when they face finance deficits. Empirical evidence in support of this contention, however, is largely absent from the literature.

**2.2. The curvilinear model (the debt capacity constraint model).** The simple model in section 2.1 does not consider the possibility of debt capacity constraint, which Chirinko and Singha (2000) critiqued. According to Lemmon and Zender (2010), pecking order firms that are constrained by debt capacity will use debts to fill small financing deficits but will turn to equity financing for larger deficits. In this section, we include the square term of financing deficit to equations (1) to (3) to capture the possible concave relationship between debts and financing deficits under the situation of debt capacity constraint, as shown in equations (4), (5), and (6).

$$\Delta D_{it} = \alpha + \beta_1 DEF_{it} + \beta_2 DEF_{it}^2 + \varepsilon_{it}, \quad (4)$$

$$\Delta D_{it} = \alpha + \beta_1 DEF_{it} + \beta_2 DEF_{it}^2 + \theta X_{it} + \varepsilon_{it}, \quad (5)$$

$$\Delta D_{it} = \alpha + \beta_1 DEF_{it} + \beta_2 DEF_{it}^2 + \beta_3 M_{it} + \beta_4 DEF_{it} * M_{it} + \beta_5 DEF_{it}^2 * M_{it} + \theta X_{it} + \varepsilon_{it}. \quad (6)$$

### 3. Results

Table 1 presents the descriptive statistics for all the variables of the entire sample and the sub-samples of DCs and MNCs, respectively. Two-tailed *t*-test statistics for equal means are also presented. In

Panel A, we classify firms as MNCs or DCs based on *FTTT* criteria, while the criteria *FITI* is shown in Panel B. From both panels, we see MNCs have significant internationalization, greater growth opportunities, are larger sizes and are more profitable. Notably, however, they own fewer tangible assets than DCs, and the net debt issues are not significantly different between the two, no matter whether the proxy of internationalization is *FTTT* or *FITI*.

Table 1. Descriptive statistics of sample variables

| Panel A. Firms classified based on their foreign tax ratios ( <i>FTTT</i> )           |        |       |            |       |             |
|---|--------|-------|------------|-------|-------------|
|   | All    |       | Sub-sample |       |             |
|   | Mean   | Std.  | DCs        | MNCs  | t-test      |
| 1991-2009   |        |       |            |       |             |
| <i>DOI (FTTT)</i>   | 0.154  | 0.259 | 0.000      | 0.436 | -132.860*** |
| $\Delta D$  | 0.004  | 0.688 | 0.002      | 0.009 | -1.097      |
| <i>DEF</i>  | 0.011  | 0.224 | 0.016      | 0.009 | 0.673       |
| <i>T</i>  | 0.271  | 0.215 | 0.307      | 0.231 | 24.610***   |
| <i>Q</i>  | 2.051  | 4.166 | 1.965      | 2.089 | -2.150**    |
| <i>LS</i>   | 5.677  | 2.043 | 4.937      | 6.442 | -51.091**   |
| <i>P</i>  | 0.074  | 0.369 | 0.057      | 0.079 | -4.469**    |
| <i>N</i>  | 24,060 |       | 15,883     | 8,177 |             |
| Panel B. Firms classified based on their foreign pre-tax income ratio ( <i>FITI</i> ) |        |       |            |       |             |
|   | All    |       | Sub-sample |       |             |
|   | Mean   | Std.  | DCs        | MNCs  | t-test      |
| 2001-2009   |        |       |            |       |             |
| <i>DOI (FITI)</i>   | 0.338  | 0.272 | 0.000      | 0.441 | -105.433*** |
| $\Delta D$  | 0.005  | 0.084 | 0.002      | 0.006 | -1.492      |
| <i>DEF</i>  | 0.012  | 0.104 | 0.017      | 0.006 | 1.659**     |
| <i>T</i>  | 0.235  | 0.180 | 0.399      | 0.225 | 10.525***   |
| <i>Q</i>  | 1.916  | 1.002 | 1.486      | 1.936 | -10.711***  |
| <i>LS</i>   | 7.170  | 1.765 | 5.239      | 7.378 | -14.784***  |
| <i>P</i>  | 0.132  | 0.078 | 0.128      | 0.135 | -0.684      |
| <i>N</i>  | 5,550  |       | 1,620      | 3,930 |             |

Notes: This study uses the foreign tax ratios (*FTTT*, 1991-2009) and foreign pre-tax income ratio (*FITI*, 2001-2009) as two proxies of internationalization (*DOI*). DCs are defined by zero foreign involvements. MNCs are identified as firms that report ratios of foreign involvements of at least 10%.  $\Delta D$  is net debt issues, *DEF* is financing deficit, *T* is tangibility, *Q* is the market-to-book ratio, *LS* is firm size, and *P* is profitability. \*, \*\*, \*\*\* represents significant levels of 10%, 5%, and 1%.

### 3.1. Results of the simple model (entire sample).

Model 1 in Table 2 shows the slope coefficients of the pooled OLS regression results for net debt issues in relation only to financing deficits as used in Shyam-Sunder and Myers (1999). Using entire sample, Model 1.1. and Model 1.2. show the results of different proxies of internationalization, *FTTT* and *FITI*, respectively. The results of equation (2), in which control variables are added, are shown in Model 2. In Model 3, the internationalization dummy is included to test if the pecking order effects are different between MNCs and DCs.

From Model 1, Model 2 to Model 3, the adj. *R*<sup>2</sup> increase and the coefficients of *DEF*\**M* are significantly positive for the two proxies of internationalization. This indicates that the fitness of the model is improved from Model 1 to Model 3, and we see MNCs are significantly different from DCs in

financing behavior. Specifically, this shows that the pecking order theory describes the financing behaviors of MNCs more than it describes the financing behaviors of DCs.

Regarding the control variables, *Tangibility* and *Firm size* are significantly positive, whereas *Market-to-Book ratio* and *Profitability* are significantly negative. The coefficients are consistent with the literature.

Table 2. Results of the simple model (the entire sample)

|                         | Model 1.1.          | Model 1.2.           | Model 2.1.          | Model 2.2.            | Model 3.1.          | Model 3.2.            |
|-------------------------|---------------------|----------------------|---------------------|-----------------------|---------------------|-----------------------|
| Intercept               | 0.004***<br>(2.089) | 0.005***<br>(5.282)  | 0.003*<br>(1.678)   | 0.005***<br>(6.310)   | 0.003<br>(1.424)    | 0.002<br>(1.195)      |
| DEF                     | 0.254***<br>(2.327) | 0.388***<br>(20.102) | 0.305***<br>(3.617) | 0.383***<br>(19.995)  | 0.277***<br>(3.019) | 0.338***<br>(10.774)  |
| M                       |                     |                      |                     |                       | 0.000<br>(-0.112)   | 0.005***<br>(3.352)   |
| DEF*M                   |                     |                      |                     |                       | 0.201**<br>(2.482)  | 0.072*<br>(1.930)     |
| $\Delta T$              |                     |                      | 0.076***<br>(2.586) | 0.004<br>(0.374)      | 0.081***<br>(2.913) | 0.003<br>(0.345)      |
| $\Delta Q$              |                     |                      | 0.008<br>(0.693)    | -0.005***<br>(-3.683) | 0.005<br>(0.518)    | -0.005***<br>(-3.793) |
| $\Delta LS$             |                     |                      | 0.001<br>(0.808)    | 0.003***<br>(6.835)   | 0.001<br>(0.762)    | 0.003***<br>(6.990)   |
| $\Delta P$              |                     |                      | 0.090**<br>(2.297)  | -0.071***<br>(-5.326) | 0.082**<br>(2.264)  | -0.069***<br>(-5.392) |
| F-statistic             | 7,510***            | 2,795***             | 1,825***            | 601***                | 1,407***            | 437***                |
| Adjusted R <sup>2</sup> | 0.238               | 0.335                | 0.275               | 0.351                 | 0.290               | 0.355                 |
| N <sup>2</sup>          | 24,060              | 5,550                | 24,060              | 5,550                 | 24,060              | 5,550                 |

Notes: DEF is financing deficit, T is tangibility, Q is the market-to-book ratio, LS is firm size, and P is profitability. M is the dummy of internationalization, 0 for DCs and 1 for MNCs. \*, \*\*, \*\*\* represents significant levels of 10%, 5%, and 1%.

**3.2. Results of the curvilinear model.** All models in Table 3 show that the coefficients of DEF are significantly positive and the coefficients of DEF<sup>2</sup> are significantly negative, indicating the concave relationship between debt and financing deficit. Specifically, firms are constrained by debt capacity

and they will use debt to fill small financing deficits but will turn to equity financing for larger deficits.

Regarding the control variables, *Tangibility* and *Firm size* are significantly positive, whereas *Market-to-Book ratio* and *Profitability* are significantly negative. The coefficients are consistent with the literature.

Table 3. Results of the debt capacity constraint model (entire sample)

|                         | Model 4.1.             | Model 4.2.           | Model 5.1.             | Model 5.2.            | Model 6.1.             | Model 6.2.            |
|-------------------------|------------------------|----------------------|------------------------|-----------------------|------------------------|-----------------------|
| Intercept               | 0.001<br>(0.910)       | 0.006***<br>(7.584)  | 0.001<br>(0.823)       | 0.007***<br>(8.399)   | 0.000<br>(-0.286)      | 0.005***<br>(3.672)   |
| DEF                     | 0.480***<br>(11.005)   | 0.414***<br>(22.571) | 0.488***<br>(10.757)   | 0.410***<br>(22.510)  | 0.489***<br>(8.760)    | 0.402***<br>(11.753)  |
| DEF <sup>2</sup>        | -0.023***<br>(-16.279) | -0.149**<br>(-1.973) | -0.022***<br>(-14.847) | -0.155**<br>(-2.091)  | -0.022***<br>(-12.113) | -0.287**<br>(-2.404)  |
| M                       |                        |                      |                        |                       | 0.005**<br>(2.500)     | 0.003*<br>(1.686)     |
| DEF*M                   |                        |                      |                        |                       | 0.019<br>(0.286)       | 0.015<br>(0.405)      |
| DEF <sup>2</sup> *M     |                        |                      |                        |                       | -0.042<br>(-0.456)     | 0.234<br>(1.564)      |
| $\Delta T$              |                        |                      | 0.099***<br>(4.511)    | 0.006<br>(0.586)      | 0.100***<br>(4.588)    | 0.005<br>(0.551)      |
| $\Delta Q$              |                        |                      | -0.002<br>(-0.233)     | -0.005***<br>(-4.079) | -0.003<br>(-0.390)     | -0.005***<br>(-4.137) |
| $\Delta LS$             |                        |                      | 0.000<br>(0.026)       | 0.003***<br>(7.107)   | 0.000<br>(0.001)       | 0.003***<br>(7.119)   |
| $\Delta P$              |                        |                      | 0.023<br>(0.940)       | -0.068***<br>(-5.471) | 0.022<br>(0.895)       | -0.066***<br>(-5.442) |
| F-statistic             | 8,858***               | 1,419***             | 2,998***               | 509***                | 2,012***               | 347***                |
| Adjusted R <sup>2</sup> | 0.424                  | 0.338                | 0.428                  | 0.355                 | 0.429                  | 0.359                 |
| N <sup>2</sup>          | 24,060                 | 5,550                | 24,060                 | 5,550                 | 24,060                 | 5,550                 |

Note: DEF is financing deficit, T is tangibility, Q is the market-to-book ratio, LS is firm size, and P is profitability. M is the dummy of internationalization, 0 for DCs and 1 for MNCs. \*, \*\*, \*\*\* represents significant levels of 10%, 5%, and 1%.

**3.3. Results of sub-sample: MNCs versus DCs.** We next divide the entire sample into MNCs and DCs and compare the pecking order behaviors between them. Following Bulan and Yan (2010), we calculate the total effect of deficit, or debt-deficit sensitivity, as the percent change in the net debt issued per one percent change in the financing deficit, evaluated at the sample mean. This figure, as the “sensitivity,” is reported in the last fourth line in Table 4.

In Model 7, the coefficients of *DEF* for MNCs and DCs are all significantly positive. Furthermore, the estimated debt-deficit sensitivity is 0.224 and 0.342 for two proxies of internationalization in the DCs sample, and 0.467 and 0.416 in the MNCs sample. Thus, the pecking order theory describes the financing behaviors of MNCs better than it describes that of

DCs. In Model 8, the coefficients of *DEF* for MNCs and DCs are all significantly positive and the coefficients of *DEF*<sup>2</sup> are all significantly negative, indicating the concave relationship between debt and financing deficit for both MNCs and DCs. Compared to Model 7, the estimated debt-deficit sensitivities in Model 8 are increased by 0.255 and 0.067 for the two proxies of internationalization in the DCs sample, and 0.034 and 0.006 for the two proxies of internationalization in the MNCs sample. Finally, when we add the control variables in Model 9, the results are similar. Thus, we can conclude that both MNCs and DCs finance their deficit with debt first and issue equity only when they reach their debt capacity. Still, the pecking order effects are larger for MNCs than DCs.

Table 4. Results of DCs and MNCs

|                                | DCs                |                      |                        |                      |                        |                       | MNCs                |                      |                      |                      |                      |                       |
|--------------------------------|--------------------|----------------------|------------------------|----------------------|------------------------|-----------------------|---------------------|----------------------|----------------------|----------------------|----------------------|-----------------------|
|                                | Model 7.1.         | Model 7.2.           | Model 8.1.             | Model 8.2.           | Model 9.1.             | Model 9.2.            | Model 7.1.          | Model 7.2.           | Model 8.1.           | Model 8.2.           | Model 9.1.           | Model 9.2.            |
| Intercept                      | 0.004*<br>(1.758)  | 0.001<br>(0.562)     | -0.001<br>(-0.471)     | 0.004***<br>(3.249)  | 0.000<br>(0.076)       | 0.006***<br>(4.086)   | 0.003***<br>(2.819) | 0.006***<br>(6.242)  | 0.004**<br>(2.400)   | 0.007***<br>(6.817)  | 0.003<br>(1.243)     | 0.007***<br>(7.308)   |
| <i>DEF</i>                     | 0.224**<br>(2.012) | 0.342***<br>(10.741) | 0.479***<br>(8.811)    | 0.409***<br>(11.888) | 0.494***<br>(8.846)    | 0.403***<br>(11.856)  | 0.467***<br>(8.102) | 0.416***<br>(18.505) | 0.501***<br>(11.617) | 0.422***<br>(20.953) | 0.490***<br>(13.065) | 0.417***<br>(20.633)  |
| <i>DEF</i> <sup>2</sup>        |                    |                      | -0.023***<br>(-12.533) | -0.300**<br>(-2.448) | -0.022***<br>(-11.560) | -0.287**<br>(-2.375)  |                     |                      | -0.068**<br>(-0.750) | -0.035**<br>(-0.364) | -0.071**<br>(-0.856) | -0.055**<br>(-0.580)  |
| $\Delta T$                     |                    |                      |                        |                      | 0.119***<br>(4.585)    | 0.009<br>(0.553)      |                     |                      |                      |                      | 0.013<br>(0.447)     | 0.000<br>(0.007)      |
| $\Delta Q$                     |                    |                      |                        |                      | -0.008<br>(-0.700)     | -0.002<br>(-1.162)    |                     |                      |                      |                      | 0.014<br>(1.289)     | -0.006***<br>(-4.360) |
| $\Delta LS$                    |                    |                      |                        |                      | 0.000<br>(0.261)       | 0.003***<br>(3.392)   |                     |                      |                      |                      | 0.000<br>(0.305)     | 0.004***<br>(7.031)   |
| $\Delta P$                     |                    |                      |                        |                      | 0.038<br>(1.273)       | -0.057***<br>(-2.901) |                     |                      |                      |                      | -0.043<br>(-1.157)   | -0.073***<br>(-4.962) |
| Sensitivity                    | 0.224              | 0.342                | 0.478                  | 0.404                | 0.488                  | 0.398                 | 0.467               | 0.416                | 0.499                | 0.422                | 0.493                | 0.417                 |
| F-statistic                    | 4,378***           | 694***               | 5,968***               | 374***               | 2,054***               | 132***                | 5,468***            | 374***               | 2,913***             | 1,091***             | 995***               | 393***                |
| Adjusted <i>R</i> <sup>2</sup> | 0.216              | 0.300                | 0.429                  | 0.315                | 0.437                  | 0.327                 | 0.401               | 0.315                | 0.416                | 0.357                | 0.422                | 0.374                 |
| <i>N</i> <sup>2</sup>          | 15,883             | 1,620                | 15,883                 | 1,620                | 15,883                 | 1,620                 | 8,177               | 3,930                | 8,177                | 3,930                | 8,177                | 3,930                 |

**3.4. Discussion.** From the present study’s results, we demonstrate that the financing behaviors of the US firms are consistent with the pecking order theory to some extent, and that the pecking order theory applies to the financing behavior of MNCs more than it does for DCs. This result remains robust even when we control some important firm characteristics related to leverage such as tangibility, growth opportunities, firm size and profitability. The results are also robust with and without debt capacity concerns.

We find that, indeed, internationalization exerts an impact on the managers’ financing decisions, which is rarely discussed in the literature. Firms in a more international environment tend to adjust their financing strategies to be more consistent with the pecking order; that is, they always use internal funds first and debts before equities when they need external funds. The implication is that the monitoring

mechanisms and disclosures in MNCs may need to improve to reduce the information asymmetry problems compared to DCs.

In summary, the present study’s result improves our understanding of pecking order behaviors from the viewpoint of internationalization. It can be used as a reference for firms intending to expand internationally and to adjust their financing behavior.

## Conclusion

The present research attempts to ascertain how well the pecking order theory applies to the US listed companies. In addition, we divide firms into multinational corporations (MNCs) and domestic corporations (DCs) due to many different characteristics between these two. The results show that the pecking order theory describes the financing behaviors of MNCs better than it does for DCs. The

results from the curvilinear regression models demonstrate a concave relationship between net debt issues and financing deficits for both MNCs and DCs, indicating that firms finance their deficit with debt first and issue equity only when they reach their debt capacity. Still, the pecking order effects are larger for MNCs than DCs. The results can be used as a

reference for firms intending to expand internationally and to adjust their financing behavior.

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#### Appendix. Variable definitions

*Cash dividends* = data127.

*Investment* = data128 + data113 + data129 – data107 – data109 – data309 – data310 (Format code 7)

*Change in net working capital* = – data302 – data303 – data304 – data305 – data307 + data274 – data312 – data301 (Format code 7)

*Internal cash flow* = data123 + data124 + data125 + data126 + data106 + data213 + data217 + data314 (Format code 7)

*Net debt issued* = data111 – data114

*Net equity issued* = data108 – data115

*Net assets* = data6 – data5

*Book assets* = data6

*Debt* = data9 + data34

*Book equity* = data6 – data181 – data10 (or data56 if data10 is missing) + data35 + data79

*Market equity* = data25 \* data199

*Market assets* = Debt + Market equity

*Market leverage* = Debt / Market assets

*Tangible assets* = data8 / data6

*Q ratio* = (data6 – Book equity + Market equity) / data6

*LogSales* = Log data12

*Profitability* = data18 + data15 + data16 / data6(t-1)

*Foreign tax ratio* = data64 / data16

*Foreign pre-tax income ratio* = data273 / (data272 + data273)