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The cost of capital: U.S.-based multinational corporations versus U.S. domestic corporations

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ABSTRACT

Using firm-level panel data, this paper examines whether the cost of capital (COC) differs significantly between U.S.-based multinational corporations (MNCs) and U.S. domestic corporations (DCs). The results suggest that U.S.-based MNCs have higher COC than U.S. DCs and that industry importantly influences COC. The study also finds that there is a significant time effect on COC, and the time effect follows the trend of the U.S. economic growth rate. Using a Bayesian Markov chain Monte Carlo approach, we estimate jointly cost of equity, cost of debt, and capital structure, and find that the higher cost of capital for MNCs is due mainly to their higher cost of equity and greater use of equity financing; the cost of debt financing does not differ significantly for MNCs versus DCs.

JEL classifications:

G30

G32

G15

Keywords:

Cost of capital

U.S.-based multinational corporations

U.S. domestic corporations

1. Introduction

A large volume of research has explored differences between multinational corporations (MNCs) and domestic corporations (DCs) in the three components of overall cost of capital (COC): cost of debt financing (Mansi & Reeb, 2002; Reeb, Mansi, & Allee, 2001), cost of equity financing (Agmon & Lessard, 1977; Brewer, 1981; Fatemi, 1984; Forssbǽck & Oxelheim, 2011; Reeb, Kwok, & Baek, 1998), and capital structure (Burgman, 1996; Chen, Cheng, He, & Kim, 1997; Chkir & Cosset, 2001; Joliet & Muller, 2013; Lee & Kwok, 1988; Mansi & Reeb, 2002; Ramirez & Kwok, 2010). Since the results on each of the three components are mixed, and since overall COC depends on all three components, it is not possible to infer the difference between MNCs and DCs in COC. Little empirical work has compared COC for MNCs and DCs.

This empirical study explores the effect of international diversification on corporate COC. This aspect of corporate activity is very important to understand the value impact on a firm of operating in the multinational domain. When firms select projects or when financial professionals evaluate a firm, the benchmark for return is usually the overall COC instead of cost of debt or cost of equity. The COC is also used to assess firms' financial performance. For example, a widely accepted measure of financial performance, economic value added (EVA), is based on comparing the COC with the return on invested capital.

This study will help in understanding how MNCs' value is influenced by international diversification through its impact on COC. Previous studies on the relationship between international diversification and firm value have shown mixed results and have not focused on the mechanism through which the relationship occurred. Christophe (1997) and Denis, Denis, and Yost (2002) document a negative relationship between international diversification and firm value. Using data for the 1990s and early 2000s, Francis, Hasan, and Sun (2008) and Gande, Schenzler, and Senbet (2009) find that international diversification increases firm value, while Santos, Errunza, and Miller (2008) find that international diversification does not destroy value. This paper takes a further step by focusing on COC, one of the two factors that directly influence firm value, and helps in answering the question as to *how* international diversification influences MNCs' value.

This paper contributes to the literature in the following three ways. (1) Many studies on international diversification focus on *whether* international diversification affects firm value. This study elucidates *how* it does so, by using firm-level data to study the effect of international diversification on U.S. firms' overall COC. (2) This study is the first to relate actual COC to real economic activities. (3) Using a Bayesian Markov chain Monte Carlo approach and the same set of data, we estimate jointly cost of equity, cost of debt, and capital structure to find out what causes the COC difference for MNCs and DCs. The three components of COC influence each other, but previous studies estimate only one of them at a time, a limitation that may render inconsistent estimation results.

The rest of this paper is organized as follows. Section 2 reviews the literature. We present the data sources, sample selection, description of several variables, and descriptive analysis in section 3. We report the results of multivariate analysis for COC in section 4, and identify the origin of the COC difference between MNCs and DCs in section 5. Robustness checks are discussed in section 6. Section 7 concludes.

2. Literature review

2.1. Overall cost of capital

There are only a few empirical studies of overall COC. Lippens (1991) infers a wide range of single-point estimates of the COC during the 1980s for Japanese firms and American firms, using the weights of debt financing and equity financing, cost of debt financing, and cost of equity financing from existing literature; however, that study assumes that all the firms in each country have the same capital structure, cost of debt, and cost of equity, hence the same COC. Hann, Ogneva, and Ozbas (2013) focus their study on the relationship between COC and product diversification, and find that the constructed expected COC (using aggregate bond index yield, the firm's implied cost of equity, and the firm's market leverage ratio) has a negative relationship with product diversification. Singh and Nejadmalayeri (2004) find that internationalized French firms use more debt financing, and hence have lower cost of capital than domestic French firms. In contrast, we examine U.S. firms. U.S. financial markets are more market-oriented, and U.S. firms may use a greater proportion of equity financing. In addition, we use a fixed-effect model, which allows us to model differences in behavior across industries and over time.

2.2. Diversification and firm value

There is a large volume of study on *product* diversification's effect on firm value (e.g., Berger & Ofek, 1995; Campa & Kedia, 2002; Gomes & Livdan, 2004; Graham, Lemmon, & Wolf, 2002; Hann et al., 2013; Lamont & Polk, 2001; Mansi & Reeb, 2002; Schoar, 2002; Villalonga, 2004; Whited, 2001). Most of these studies focus on how the cash flow difference caused by product diversification influences firms' value. Lamont and Polk (2001) and Hann et al. (2013) examine the other factor that can influence firms' value, the COC; and the latter authors conclude that the expected COC for product-diversified firms is lower because of the coinsurance effect.

There are also a growing number of studies on the relationship between international diversification and firm value. The results are mixed, and various theories are proposed to explain the international diversification discount or premium, such as imperfect market theory, internalization theory, and agency theory. Christophe (1997) documents a negative relationship between international diversification and firm value due to adverse shift of foreign exchange rates. The study relates international diversification's effect on firm value to the change in exchange rate and illustrates the importance of financial markets on international diversification. Using data for U.S. firms over the period 1984 to 1997, Denis et al. (2002) find that globally diversified firms trade at discount relative to domestic firms operating in the same industries. They conjecture that the global diversification discount is an agency cost: managers' decisions to diversify globally may reflect their incentive-based compensation plans. Santos et al. (2008) find that cross-border acquisition does not destroy value if the acquired firm is fairly valued before the acquisition. Using data from the 1990s and early 2000s, Francis et al. (2008) and Gande et al. (2009) find that international diversification increases firm value. Gande et al. (2009) find that it does so by internalizing markets for intangible assets and by providing investors indirect access to countries with restrictions on portfolio holdings. Highlighting the importance of cost of financing in performance after an acquisition, Francis et al. (2008) propose that U.S. firms that acquire firms in foreign segmented financial markets use more external funding after the acquisition to lower financing cost for the acquired firms.

Some of these studies reveal that the financial environment may affect firm value, but none of them directly links the international diversification premium or discount with COC. This study will help us understand *how* the COC difference contributes to firms' value difference from international diversification.

2.3. Financing cost and real economic activities

There are some studies that relate stock market performance to real activity. Chen, Roll, and Ross (1986) relate individual stock returns to a set of state variables, the most economically significant being the growth rate of monthly industrial production. The higher (lower) the production growth rate, the higher (lower) the stock return. Fama (1990) also finds a positive relationship between real stock market return and economic growth rate. Chen (1991) finds that excess market return, defined as the difference between the NYSE index and the Treasury bill rate, has a negative relationship with the recent monthly economic growth rate. These studies imply that the cost of equity depends on economic growth.

Cost of debt also may also relate to economic activity. In a slow economy, the Federal Reserve System (the Fed) usually implements expansionary monetary policy to stimulate the economy, and this lowers the cost of debt. In an overheated economy, the Fed may be concerned about the inflation rate and hence conduct contractionary monetary policy, which raises the cost of debt.

There are two main ways of financing, debt financing and equity financing. Both cost of debt financing and cost of equity financing are related to economic activity over time; we therefore propose that there is a time effect on the COC that correlates with the economic growth rate.

3. Data

3.1. Data sources

We mainly use the databases of Compustat, Mergent Fixed Income Securities Database (FISD), and the 2013 EVA/MVA Ranking and the 2006 US 1000 EVA/MVA Annual Ranking

Database. The 2013 EVA/MVA Ranking and the 2006 US 1000 EVA/MVA Annual Ranking Database are rarely explored in academia and provide data on the actual COC and market value of firms. The sample observations on geographical segment sales, total long-term debt, total assets, beta (β), net profits, and depreciation are from Compustat. Treasury spread at the time of a bond's issuance is from Mergent FISD. For a robustness check, we also resort to the TRACE database for corporate bond trading data, Mergent FISD for bonds' maturity dates, and the Federal Reserve Bank's H15 release for the yield on Treasury securities.

Utilities firms (GICS[1] codes 551010–551040) and financial firms (GICS codes 401010–404010) are excluded from the sample. Following previous research, we limit the final sample to firms with total assets of more than $10 million. We also eliminate firm-year observations where there is negative income tax. In addition, we delete the top and bottom 2.5% of observations of variables such as COC, debt ratio, and income tax rate, to deal with possible outlier problems.

We begin with the firms listed in the 2013 EVA/MVA Ranking and 2006 US 1000 EVA/MVA Annual Ranking Database, and then retrieve the corresponding accounting data from Compustat. If a firm-year observation does not have all the variables, we delete that observation.

If a firm has merged, filed bankruptcy, or otherwise ceased to exist, then it does not have complete data for the whole period 1994 to 2013. We keep all firm-year observations in this study even if a firm does not have data for the whole period. The final sample consists of 1,228 firm-year observations.

3.2. Variables

[1] The Global Industry Classification Standard (GICS), a set of standard industry definitions, was developed by Morgan Stanley Capital International (MSCI) and Standard and Poor's (S&P).

Stern & Stewart Co., the provider of the COC data used in this study, defines COC as "The minimum return on capital a firm must earn to create value. It is equal to the return investors could expect to earn from buying stocks and bonds in other companies of comparable risk." Stewart (1990) specifies that the COC is the weighted average of cost of debt and cost of equity, where the cost of debt is the after-tax yield to maturity on the firm's own outstanding and publicly traded bonds; cost of equity is obtained by using a capital asset pricing model (cost of equity is risk-free return plus the risk premium for the firm, where the risk premium for the firm is obtained by multiplying the firm's beta by the market risk premium); and the weights are the target debt-to-capital and target equity-to-capital ratios.

Stewart (1991) specifies the formula for weighted average COC as follows:

$$\begin{aligned} Cost\ of\ Capital = & \ (1 - Marginal\ Tax\ Rate) * Yield\ to\ Maturity * \frac{Debt}{Capital} \\ & + Cost\ of\ Equity * \frac{Equity}{Capital} \end{aligned} \quad (1)$$

In the literature, foreign sales ratio, foreign assets ratio, foreign tax ratio, and the number of countries in which the firm operates have been used to measure the degree of internationalization and to define MNCs and DCs. The foreign sales (assets, tax) ratio is defined as the annual sales revenue (assets, tax) generated in foreign countries divided by total sales revenue (assets, tax) for the company. However, as Wang and Mathur (2011) explain, the foreign sales ratio may be biased as an index for the degree of international diversification: if an MNC sells its product in only one risky country, and the sales in that foreign country account for a large portion of its total sales, the foreign sales ratio suggests a large amount of international diversification, while the effective degree of international diversification is actually small. Following Wang and Mathur (2011), to measure the degree of international diversification for each firm-year, this study constructs a composite measurement that combines both the foreign sales ratios and the number of geographical segments, in the format of the Herfindahl-Hirschman index (HHI), as follows:

$$HHI = \sum_{i=1}^{n} \left[\frac{Sales_i}{\sum_{i=1}^{n} Sales_i} \right]^2$$

(2)

where n is the number of geographical segments, and $sales_i$ is the sales at the ith geographical segment. The value of this composite measurement is greater than 0 and less than or equal to 1. Firms that have lower composite measurements (HHIs) are more internationalized.

We rank the firm-year observations from smallest to largest HHI and divide the whole sample into quartiles. The top quartile is defined as MNCs (more internationalized firms), and the bottom quartile is defined as DCs (less internationalized firms). By ignoring the middle two quartiles, we hope to make the difference between MNCs and DCs more noticeable. There are 614 firm-year observations for each group, MNCs and DCs. D_1 is the firm type dummy. It equals one if the firm-year observation is for an MNC and zero otherwise.

LNTotalAsset, natural logarithm of total assets, is an index for firm size. ROA is return on assets, which is defined as net income divided by total assets. The intuition is that the higher the ROA, the stronger the firm's ability to generate cash flows from its operations, the lower the risk for investors, and hence the lower the COC, all else equal. We expect a negative coefficient for ROA.

The debt ratio is calculated by dividing the book value of long-term debt by the sum of the book value of long-term debt and the market value of equity. The debt ratio affects the COC in various ways. On one hand, debt financing is riskier than equity financing since debt financing increases firms' distress cost, so the more debt financing a firm uses, the higher return its investors would seek. Previous studies (e.g., Hamada, 1972) find that when firms use more debt, the risk related to stock investment increases. This implies a higher COC. On the other hand, since creditors assume less risk than stockholders, the cost of debt is generally lower than the cost of equity. Therefore, a higher debt ratio may result in a lower COC. In addition, given that interest payments for debt financing are tax deductible, greater debt is expected to generate tax shield benefits resulting in lower COC. To summarize, financial leverage is a material factor in COC, even though the direction of the influence is not clear.

M/B is the market-to-book ratio, a measure for growth opportunity. It is computed as the market value of assets divided by the book value of assets. A higher value is generally taken as a sign of more future growth options as well as higher risk. Given that smaller firms and firms with future growth prospects tend to have higher M/B, we expect that this variable will associate positively with a firm's COC.

IncomeTaxRate is the effective income tax rate, which is calculated by dividing income taxes by pretax income for each firm year. The higher the income tax rate, the lower the after-tax cost of debt due to the tax saving effect of debt financing, and hence the lower the COC. We expect a negative coefficient for IncomeTaxRate.

3.3. Descriptive analysis

Table 1 presents the descriptive statistics for MNCs and DCs, respectively. Included are the means, standard deviations (SD), minimums, and maximums for the following variables: COC, natural logarithm of total assets, return on assets, market-to-book ratio, debt ratio, and income tax rate. The descriptive statistics show that the mean COC is about 8.44 percent for MNCs and 7.95 percent for DCs. MNCs have a higher COC before we consider firm-specific characteristics that could affect the COC. On average, MNCs are larger than DCs: MNCs have a mean logarithm of total assets of 8.85, while DCs' mean logarithm of total assets is 7.78. MNCs also have a higher mean return on assets. The market-to-book ratio is higher for MNCs than for DCs, suggesting that MNCs have more growth opportunities. On average, MNCs have a smaller proportion of their capital financed with debt than do DCs. MNCs have a lower effective income tax rate. MNCs take advantage of tax differences across countries.

Table 1

Descriptive analysis.

Variable	MNCs				DCs			
	Mean	SD	Minimum	Maximum	Mean	SD	Minimum	Maximum
COC	8.4409	2.7809	3.9200	15.7400	7.9519	2.1810	4.0000	15.8300
LNTotalAssets	8.8468	1.3583	5.2938	12.7183	7.7837	1.4158	4.0007	11.3200
ROA	7.7896	4.7790	-5.3570	21.2277	6.8294	4.2499	-4.9848	20.9594
DebtRatio	0.1151	0.0951	0.0000	0.4857	0.1715	0.1428	0.0000	0.5821
M/B	1.7300	0.8408	0.4296	5.4461	1.6300	0.8357	0.4932	5.3348
IncomeTaxRate	29.2401	9.3900	5.3374	65.5914	35.2750	6.9759	6.3989	65.5515
Number of Observations	614				614			

Notes: The data set comprises 1228 firm-year observations for 1994–2013. DebtRatio is calculated by dividing book value of long-term debt by the sum of book value of long-term debt and market value of equity.

The differences in these variables reflect the differences in firm-specific characteristics between MNCs and DCs. The question is whether the differences in firm-specific characteristics can explain the difference in their COC. The multivariate analysis in the next section shows that even after we consider key firm-specific characteristics, industry effect, and time effect, MNCs still have a higher COC than DCs.

4. Methods and results

To test the relationship between COC and firm type, we use the following specification:

$$COC_{i,t} = \alpha_0 + \alpha_1 D_{1i,t-1} + \alpha_2 LNTotalAssets_{i,t-1} + \alpha_3 ROA_{i,t-1} + \alpha_4 DebtRatio_{i,t-1} + \alpha_5 M/B_{i,t-1} + \alpha_6 IncomeTaxRate_{i,t-1} + \varepsilon_{i,t} \quad (3)$$

where subscript *i,t-1* means the value for firm i at year t-1. We posit that the COC for firm i at time t is determined by creditors' and investors' expectation of the firm's future characteristics, and that a firm's characteristics at time t-1 are rational forecasts for that firm's future characteristics. Hann et al. (2013) use firm size, capital structure, and book-to-market ratio as control variables to find the relationship between COC and product diversification. Strong profitability generally implies lower risk for firms and hence lower COC, and income tax rate directly influences after-tax cost of debt and COC. We therefore also include profitability and income tax rate as control variables.

The estimated coefficients for Equation 3 are listed in Table 2. D_1 has a statistically significant positive coefficient, which shows that MNCs have higher COC than DCs during the period 1994 to 2013. The fixed industry and time effects increase adjusted R^2 dramatically from 0.2692 to 0.9306, which shows that there are significant industry and time effects. Once industry and time effects are considered, the COC difference between MNCs and DCs decreases from 45 basis points to 26 basis points. The higher COC for MNCs puts downward pressure on their value, and hence contributes to a value discount for MNCs, all else equal.

Table 2

COC regressions: U.S.-based MNCs versus U.S. DCs.

	1994–2013	
	(1)	(2)
Intercept	11.2789***	6.6510***
	(<0.0001)	(<0.0001)
D_1	0.4536***	0.2636***
	(0.0018)	(<0.0001)

LNTotalAssets	-0.3646***	-0.1140***
	(<0.0001)	(<0.0001)
ROA	-0.0504***	0.0026
	(0.0032)	(0.6466)
DebtRatio	-6.2048***	-3.1871***
	(<0.0001)	(<0.0001)
M/B	0.6882***	0.0823**
	(<0.0001)	(0.0110)
IncomeTaxRate	-0.0051	-0.0086***
	(0.4920)	(0.0004)
Industry Fixed Effect	No	Yes
Time Fixed Effect	No	Yes
Adjusted R^2	0.2692	0.9306
Number of Observations	1228	1228

Notes: The dependent variable is cost of capital, the weighted average of cost of debt and cost of equity. D_1, the firm type dummy variable, equals one if the firm-year observation is for an MNC, and zero for a DC. LNTotalAssets, the natural logarithm of total assets, is a measure of firm size. ROA is return on total assets. DebtRatio is calculated by dividing book value of long-term debt by the sum of book value of long-term debt and market value of equity. M/B is the market-to-book ratio, a measure of growth opportunity, and is computed as the market value of assets divided by the book value of assets. IncomeTaxRate is computed by dividing income taxes by taxable income. Data are for the years 1994–2013. The *p*-values are in parentheses. *Significant at 10%, **significant at 5%, ***significant at 1%.

As for the control variables, firm size and debt ratio have statistically significant negative coefficients, consistent with the results of Hann et al. (2013) and Singh and Nejadmalayeri (2004). Larger firms are likely to have greater access and recognition in the capital markets and therefore lower COC. The more debt the firms use, the lower the COC. It seems that the lower cost of debt financing dominates the cost increase caused by the higher bankruptcy risk of greater leverage. Among other control variables, income tax rate is negatively related to COC. The higher the effective income tax rate for the firm during the study period, the lower the COC.

Profitability (ROA) does not have a statistically significant effect on COC when time and industry effects are considered. The market-to-book ratio has a positive coefficient, consistent with the result found by Hann et al. (2013). One reason for the positive relationship will be shown in section 5: firms with higher market-to-book ratios have statistically lower debt ratios—that is, these firms use less of the relatively cheaper debt financing, and more of the relatively costly equity financing.

COC changes with industry and time (the regression results for industry and time are not included in this article but are available upon request). More specifically, the COC for "Technology Hardware & Equipment" and "Semiconductors & Semiconductor Equipment" is much higher than that for other industries, and MNCs dominate in these two industries. The result is consistent with previous studies (e.g., Burgman, 1996) in that the higher COC for MNCs shown in descriptive analysis is related to the different industries on which MNCs and DCs focus.

When we examine the time effect further, we find that all year dummies are statistically significant. The time effect of COC decreases over time during the study period.

We sort the data by year and industry and list the COC for each industry each year in Table 3. The COC of the industry is the arithmetic average of the COC for all companies in the industry for any particular year. Table 3 reveals that the COC varies across industries for the same year. For example, "Semiconductors and Semiconductor Equipment" has a higher COC, while the energy sector has a lower COC. Table 3 also shows that for each industry and for all firms the general trend for COC from 1994 to 2013 is decreasing. The information in Table 3 and our findings about the industry and time effects from the multivariate analysis based on equation 3 substantiate each other.

Table 3

COC of U.S. firms during 1994–2013.

Year	Industry										All firms
	Energy	Materials	Capital Goods	Food & Staples Retailing	Health Care Equipment & Services	Technology Hardware & Equipment	Consumer Durables & Apparel	Pharmaceuti-cals & Biotechnology	Semiconductors & Semiconductor equipment	Automobiles & Components	Average
1994	8.45	8.63	9.09	9.24	9.15	12.05	9.22	9.70	15.28	10.07	10.09
1995	8.12	8.29	8.66	9.35	9.58	12.91	8.88	10.99	15.18	10.88	10.28
1996	7.72	8.20	8.50	8.80	8.35	12.28	8.83	9.39	14.77	9.04	9.59
1997	8.01	8.21	8.35	8.90	8.51	11.90	8.57	9.74	14.75	10.20	9.71
1998	7.43	6.98	7.30	7.96	7.57	11.60	7.57	9.72	13.68	8.30	8.81
1999	7.77	7.25	7.56	7.85	7.53	11.49	7.75	8.43	13.58	8.17	8.74
2000	7.85	7.17	7.81	8.21	7.35	11.77	7.67	9.16	13.50	8.36	8.88
2001	7.56	6.87	7.42	7.71	7.24	11.30	7.34	8.72	13.57	8.40	8.61
2002	7.29	6.66	7.32	7.46	7.49	10.53	7.04	8.55	13.43	7.81	8.36
2003	7.39	6.66	6.90	7.31	7.67	10.60	6.93	n/a	13.48	7.31	8.25
2004	7.41	6.52	6.65	7.02	7.20	10.16	6.75	8.64	13.30	7.16	8.08
2005	7.35	6.25	6.78	6.95	7.25	10.30	6.90	9.08	13.05	7.12	8.10
2006	6.88	6.52	6.70	n/a	7.05	10.36	6.73	9.42	12.95	6.95	8.17
2007	7.05	6.81	6.96	6.73	8.33	10.39	6.99	9.61	13.18	7.20	8.33
2008	6.89	6.68	6.84	6.48	7.21	10.18	6.88	9.26	13.10	7.01	8.05
2009	6.54	6.15	6.46	6.05	6.60	10.05	6.44	n/a	12.76	6.51	7.51

2010	6.74	5.97	6.37	6.12	6.35	10.05	n/a	n/a	11.98	6.83	7.55
2011	6.07	5.81	6.07	6.01	6.16	9.22	6.03	6.87	12.03	6.26	7.05
2012	5.74	5.28	5.62	5.74	5.34	8.55	5.60	6.24	11.55	5.69	6.53
2013	5.12	4.59	4.99	n/a	4.56	7.75	4.60	5.46	10.90	4.96	5.88
Observations	263	154	348	32	54	92	74	23	145	43	1228

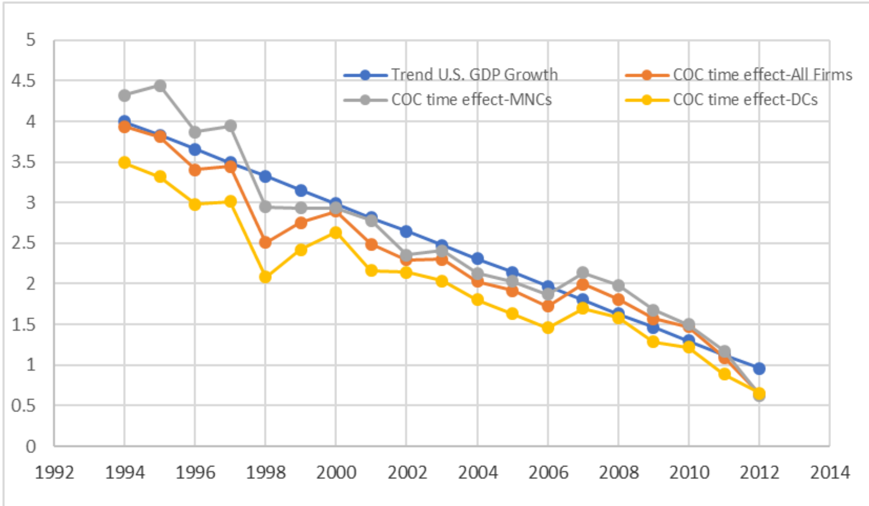

Fig. 1. COC time effect and GDP growth rate. **(PLEASE USE COLOR FOR THIS FIGURE IN PRINT.)**

We plot the time effect estimation from the fixed industry and time effect regression, and the real annual U.S. GDP growth rate on the time line.

Given the findings of previous studies that relate stock market performance to real activity, and the monetary policy reactions to real activity that are mentioned in section 2.3, we relate COC to U.S. economic growth. Fig. 1, which plots the coefficients we find for each year when we include time effect in the regressions along with the trend of U.S. real GDP growth rate, shows that the pattern of the COC time effect follows the trend of real GDP growth rate. Both decrease over the study period.

Since the main focus of this study is on the COC difference between U.S.-based MNCs and U.S. DCs, we run the regression of equation 3 on MNCs and DCs separately. Table 4 shows the regression results. The COC time effects for MNCs and for DCs are shown in Fig. 1 along with the time effect for all firms and the U.S. GDP growth rate for comparison. The time effects of MNCs and DCs have the same patterns as the time effects for all firms, and follow the trend of the U.S. GDP growth rate. MNCs have higher COC time effect than DCs.

Regarding the control variables, the results in Table 4 are consistent with those in Table 2: firm size and debt ratio are significantly negative for both MNCs and DCs, while profitability does not have a significant effect on COC. Market-to-book ratio and income tax rate are more economically and statistically significant for MNCs than for DCs. The significant effect

Table 4

COC regressions: U.S.-based MNCs and U.S. DCs.

	MNCs		DCs	
	(1)	(2)	(1)	(2)
Intercept	12.7755***	6.8368***	11.4324***	6.9068***
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
LNTotalAssets	-0.373***	-0.0549***	-0.4146***	-0.1500***
	(<0.0001)	(0.0060)	(<0.0001)	(<0.0001)
ROA	-0.0776***	-0.0106	-0.0231	0.0116
	(0.0019)	(0.1088)	(0.3073)	(0.1792)
DebtRatio	-11.9771***	-2.0334***	-3.6219***	-3.0909***
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
M/B	0.4808***	0.1076***	0.7335***	0.0169
	(0.0012)	(0.0074)	(<0.0001)	(0.7228)
IncomeTaxRate	0.0040	-0.0150***	-0.0183*	-0.0069*
	(0.7088)	(<0.0001)	(0.0760)	(0.0776)
Industry Fixed Effect	No	Yes	No	Yes
Time Fixed Effect	No	Yes	No	Yes
Adjusted R^2	0.2496	0.958	0.3376	0.9185
Number of Observations	614	614	614	614

Notes: The dependent variable is cost of capital, the weighted average of cost of debt and cost of equity. LNTotalAssets, the natural logarithm of total assets, is a measure of firm size. ROA is return on total assets. DebtRatio is calculated by dividing book value of long-term debt by the sum of book value of long-term debt and market value of equity. M/B is the market-to-book ratio, a measure for growth opportunity, and is computed as the market value of assets divided by the book value of assets. IncomeTaxRate is computed by dividing income taxes by taxable income. Data are for the years 1994–2013. The *p*-values are in parentheses. *Significant at 10%, **significant at 5%, ***significant at 1%.

of these two control variables for COC that we observe in Table 2 comes mainly from the MNCs. MNCs with higher market-to-book ratio have higher COC. MNCs react more actively to income tax rate than DCs—specifically, a higher income tax rate lowers COC more for MNCs.

5. Do MNCs have higher cost of equity, higher cost of debt, or both?

The analysis in section 4 shows that MNCs have higher cost of capital. One interesting and important follow-up question is what component causes this higher cost of capital—higher cost of equity, higher cost of debt, or lower debt ratio? The previous literature studies each component separately. However, cost of debt, cost of equity, and capital structure depend on each other. In this section we consider a model with correlated errors.

The base models for cost of equity, cost of debt, and capital structure are as follows.

$$Beta_{i,t} = \alpha_0 + \alpha_1 D_{1i,t} + \alpha_2 LNTotalAssets_{i,t} + \alpha_3 DebtRatio_{i,t} + \alpha_4 M/B_{i,t} + \varepsilon_{i,t}$$

(4)

$$TreasurySpread_{i,t} = \beta_0 + \beta_1 D_{1i,t} + \beta_2 LNTotalAssets_{i,t} + \beta_3 DebtRatio_{i,t} + \beta_4 ROA_{i,t} + \beta_5 CurrentRatio_{i,t} + \omega_{i,t} \quad (5)$$

$$DebtRatio_{i,t} = \gamma_0 + \gamma_1 D_{1i,t} + \gamma_2 LNTotalAssets_{i,t} + \gamma_3 ROA_{i,t} + \gamma_4 M/B_{i,t} + \gamma_5 Depreciation_{i,t} + \upsilon_{i,t}$$

(6)

Here $\varepsilon_{i,t}$, $\omega_{i,t}$, and $\upsilon_{i,t}$ are independent random variables.

The other two models have the same equations as the base models; however, $\varepsilon_{i,t}$, $\omega_{i,t}$, and $\upsilon_{i,t}$ are correlated with each other.

$$\begin{bmatrix} \varepsilon_{i,t} \\ \omega_{i,t} \\ \upsilon_{i,t} \end{bmatrix} \sim N\left(\begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} \sigma_{11} & \sigma_{12} & \sigma_{13} \\ \sigma_{21} & \sigma_{22} & \sigma_{23} \\ \sigma_{31} & \sigma_{32} & \sigma_{33} \end{bmatrix} \right) \tag{7}$$

This is in fact a seemingly unrelated regression (SUR) model. The first analysis of the standard SUR model is presented by Zellner (1962), using a generalized least squares approach, while Zellner (1971) introduces a Bayesian estimation approach with analytical results, followed later by various other techniques. Percy (1992) has shown that the Markov chain Monte Carlo approach is eminently suitable for estimating the parameters of a SUR model. This approach also can easily be used to predict out-of-sample observations and handle in-sample missing data. The Gibbs sampler for the SUR model performs extremely well with relatively trivial computation costs.

Consistent with Zellner (1962, 1971) and Percy (1992), we use normal error terms in our models. Therefore, following Lamoureux and Nejadmalayeri (2015), we estimate the model using Gibbs sampling. The Gibbs sampler sequentially draws from the full conditional densities of parameters. The conditional densities used in Gibbs sampling are given by Rossi, Allenby, and McCulloch (2005). For all models, we discard the first 500,000 draws as a burn-in, and construct the posterior densities for parameters from the next 100,000 draws.

Tables 5, 6, and 7 show the regression results for cost of equity, cost of debt, and capital structure, respectively. In Table 5 all four models have a positive and statistically significant coefficient for the MNCs dummy variable, which suggests that cost of equity is higher for MNCs. Fatemi and Fooladi (2006) find similar results for Canadian firms: the firm’s beta increases with international diversification.

Table 5

Cost of equity.

	(1)	(2)	(3)	(4)
Intercept				
Mean	**1.215**	**0.9569**	**0.6937**	-0.8533
Std Dev	0.2571	0.4627	0.2745	0.8018
5%ile	0.7952	0.1811	0.2335	-2.394
95%ile	1.64	1.69	1.129	0.2674
D1				
Mean	**0.2259**	**0.2533**	**0.1338**	**0.2808**
Std Dev	0.05908	0.07124	0.06377	0.102
5%ile	0.1284	0.1381	0.02912	0.128
95%ile	0.3227	0.3716	0.2384	0.4595
LNTotalAssets				
Mean	-0.00845	-0.00235	-0.02105	0.02061
Std Dev	0.02257	0.02491	0.02408	0.03549
5%ile	-0.04582	-0.04268	-0.05979	-0.0319
95%ile	0.02795	0.03864	0.01906	0.08482
DebtRatio				
Mean	-0.109	0.3988	**0.7604**	**3.795**
Std Dev	0.291	0.7987	0.3096	1.446
5%ile	-0.5869	-0.8735	0.2509	1.789
95%ile	0.3695	1.735	1.272	6.572
M/B				
Mean	**-0.1416**	-0.08289	0.09481	**0.4733**
Std Dev	0.0531	0.1005	0.05927	0.1904
5%ile	-0.2291	-0.2436	-0.00204	0.2118

95%ile	-0.05412	0.08437	0.1917	0.8511
Industry Dummy	No	No	Yes	Yes
Year Dummy	No	No	Yes	Yes
Error Correlation	No	Yes	No	Yes

Notes: The dependent variable is beta, which is a proxy for cost of equity, following Francis *et al*. (2008). D_1, the firm type dummy variable, equals one if the firm-year observation is for an MNC, and zero for a DC. LNTotalAssets, the natural logarithm of total assets, is a measure of firm size. DebtRatio is calculated by dividing book value of long-term debt by the sum of book value of long-term debt and market value of equity. M/B is the market-to-book ratio, a measure of growth opportunity, and is computed as the market value of assets divided by the book value of assets. Data are for the years 1993–2012. We have 281 observations. Coefficients that are significant at the 5% (or lower) level are denoted in **BOLD**.

As for control variables, the higher the debt ratio, the higher the cost of equity. This is consistent with previous studies such as that of Hamada (1972), in that capital structure influences systematic risk. The higher the market-to-book ratio, the higher the cost of equity. Firm size has a negative relationship with cost of equity, but the relationship is not statistically significant.

The cost-of-debt regression results suggest that when it comes to debt financing, lenders do not differentiate between MNCs and DCs. Cost of debt is more influenced by the timing of

Table 6

Cost of debt.

	(1)	(2)	(3)	(4)
Intercept				
Mean	9.826	-0.8851	**194.3**	**180.4**
Std Dev	61.17	70.95	55.66	63.8
5%ile	-88.77	-115.5	103.1	79.15
95%ile	110.5	118.6	286.2	286.4
D1				
Mean	23.98	**30.9**	-0.1223	4.795

Std Dev	15.16	17.51	13.46	15.67
5%ile	-0.9214	2.419	-22.19	-20.66
95%ile	48.97	60	22.11	30.54
LNTotalAssets				
Mean	1.68	0.4668	**-20.27**	**-20.76**
Std Dev	5.745	5.521	5.038	4.953
5%ile	-7.799	-8.624	-28.75	-28.9
95%ile	11.04	9.48	-12.18	-12.61
DebtRatio				
Mean	**374.2**	**454.1**	**284.4**	**344.1**
Std Dev	69.93	163	57.47	116
5%ile	258.7	187.7	189.7	153.6
95%ile	488.8	722.6	379.3	535.1
ROA				
Mean	0.9318	2.303	-0.7974	0.1777
Std Dev	1.826	2.988	1.509	2.082
5%ile	-2.071	-2.577	-3.272	-3.233
95%ile	3.94	7.253	1.685	3.585
CurrentRatio				
Mean	**18.97**	14.9	-12.71	-13.77
Std Dev	9.702	9.532	9.249	9.07
5%ile	2.975	-0.6296	-27.89	-28.51
95%ile	34.87	30.69	2.457	1.289
Industry Dummy	No	No	Yes	Yes
Year Dummy	No	No	Yes	Yes
Error Correlation	No	Yes	No	Yes

Notes: The dependent variable, Treasury spread, measures the cost of debt of the issuing company; it is defined as the difference between the issue's offering yield and the yield of the Treasury security with corresponding maturity *at the time of a bond's issuance*, expressed in basis points. D_1, the firm type dummy variable, equals one if the firm-year observation is for an MNC, and zero for a DC. LNTotalAssets, the natural logarithm of total assets, is a measure of firm size. DebtRatio is calculated by dividing book value of long-term debt by the sum of book value of long-term debt and market value of equity. ROA is return on total assets.

CurrentRatio, which measures liquidity, is calculated by dividing current assets by current liabilities. Data are for the years 1993–2012. We have 281 observations. Coefficients that are significant at the 5% (or lower) level are denoted in **BOLD**.

borrowing: the year dummy variable explains a lot of the variation in cost of debt. When we compare debt financing and equity financing, the year dummy variables for the cost of debt regressions have larger coefficients and more of them are statistically significant. Market timing can help lower financing cost more for debt financing than for equity financing. Among the control variables, debt ratio and firm size are two factors that significantly influence cost of debt. Debt ratio has a positive relationship with cost of debt: the more debt the firm is using, the higher its cost of debt, reflecting the larger default risk premium imposed by lenders. Firm size is both economically and statistically significant in explaining cost of debt even though it is not significant in explaining cost of equity. The larger the firm size, the lower the cost of debt financing. Unlike stockholders, lenders rely on firm size to provide a margin of safety when evaluating risk and the return required for providing funds.

Table 7 shows that MNCs have lower debt ratios, which demonstrates that U.S.-based MNCs use less debt financing and more equity financing. This finding is consistent with those of previous studies about capital structure in that U.S. MNCs have lower debt ratios (Burgman, 1996; Chen et al., 1997; Lee & Kwok, 1988; Low & Chen, 2004). Debt usage is negatively related to firm size: the larger the firm, the lower the debt ratio. More profitable firms have a lower debt-to-capital ratio: even though they have stronger ability to borrow money, they finance less of their capital with debt. The larger the market-to-book ratio, the less debt is used. Scaled depreciation measures the nondebt tax shield. It has a negative coefficient, which shows that the larger the nondebt tax shield, the lower the debt ratio. The presence of a large nondebt tax shield makes the tax shield function from debt financing less valuable.

Previous studies show that the capital structure decision is driven not only by economic factors, but also by the labor market, the product market, suppliers and customers, institutional environments, etc. This study finds that MNCs use less debt than DCs, which contributes to higher COC. Even though the capital structure decision is influenced by many factors, increasing debt usage is one of the possible ways that MNCs can consider to lower their COC and increase firm value.

Table 7

Capital structure.

	(1)	(2)	(3)	(4)
Intercept				
Mean	**0.444**	**0.4475**	**0.4905**	**0.4886**
Std Dev	0.04268	0.04032	0.04666	0.04563
5%ile	0.3731	0.3802	0.4152	0.4127
95%ile	0.5135	0.5137	0.5688	0.5653
D1				
Mean	**-0.04722**	**-0.04706**	**-0.04741**	**-0.04784**
Std Dev	0.01101	0.0109	0.01241	0.01226
5%ile	-0.06544	-0.065	-0.06788	-0.06789
95%ile	-0.02919	-0.02916	-0.02705	-0.02756
LNTotalAssets				
Mean	-0.00516	-0.005606	**-0.009439**	**-0.00983**
Std Dev	0.004473	0.004224	0.004911	0.004755
5%ile	-0.0124	-0.0125	-0.01778	-0.01769
95%ile	0.002288	0.001435	-0.001566	-0.001909
ROA				
Mean	**-0.009842**	**-0.009684**	**-0.006074**	**-0.006341**
Std Dev	0.001383	0.001403	0.001521	0.001447
5%ile	-0.01212	-0.01197	-0.008554	-0.008745

95%ile	-0.007573	-0.007366	-0.003565	-0.003977
M/B				
Mean	**-0.07387**	**-0.07398**	**-0.09421**	**-0.09331**
Std Dev	0.009754	0.009827	0.01142	0.01148
5%ile	-0.08991	-0.09022	-0.113	-0.1123
95%ile	-0.05776	-0.05796	-0.07515	-0.07455
ScaledDepreciation				
Mean	-0.004182	-0.004919	**-0.05248**	**-0.04118**
Std Dev	0.02418	0.02345	0.02768	0.02449
5%ile	-0.04397	-0.04333	-0.09807	-0.08259
95%ile	0.03539	0.03366	-0.006894	-0.002442
Industry Dummy	No	No	Yes	Yes
Year Dummy	No	No	Yes	Yes
Error Correlation	No	Yes	No	Yes

Notes: The dependent variable, debt ratio, is calculated by dividing long-term debt by the sum of long-term debt and market value of equity. D_1, the firm type dummy variable, equals one if the firm-year observation is for an MNC, and zero for a DC. LNTotalAssets, the natural logarithm of total assets, is a measure of firm size. ROA is return on total assets. DebtRatio is calculated by dividing the book value of long-term debt by the sum of book value of long-term debt and market value of equity. M/B is the market-to-book ratio, a measure of growth opportunity, and is computed as the market value of assets divided by the book value of assets. ScaledDepreciation is depreciation divided by total assets. Data are for the years 1993–2012. We have 281 observations. Coefficients that are significant at the 5% (or lower) level are denoted in **BOLD**.

Table 8 compares all four models, with or without correlated errors, with or without industry and time effects. For models without correlated errors, when industry and time effect are included, the deviance information criterion (DIC) decreases from 3,114 to 2,936. Similarly, for models with correlated errors, the DIC decreases from 3,109 to 2,919. The dramatic decrease in DIC when industry effect and time effect are considered shows that industry and time are important factors. On the other hand, when we compare the models with correlated errors, we find that the DIC also decreases significantly, from 3,114 to 3,109, when the industry and year dummy variables are not included, and from 2,936 to 2,919 when they are included. Overall, the model with industry and time effect and correlated errors has the smallest DIC and therefore has the best short-term predictive ability.

Table 8

Deviance information criteria (DIC) of the models.

	(1)	(2)	(3)	(4)
Dbar	3,094.0	3,086.0	2,831.0	2,810.0
pD	20.0	23.0	105.0	109.0
DIC	3,114.0	3,109.0	2,936.0	2,919.0
Industry Dummy	No	No	Yes	Yes
Year Dummy	No	No	Yes	Yes
Error Correlation	No	Yes	No	Yes

Notes: This table presents the deviance information criteria (DIC) of the four models we consider in this paper. DIC = Dbar + pD. This deviance is defined as – 2 * log(likelihood). Dbar is the posterior mean of the deviance. pD is the posterior mean of the deviance minus the deviance of the posterior means. The model with the smallest DIC has the best short-term predictive ability.

In summary, Tables 5, 6, 7, and 8 show that there is no significant difference in cost of debt for MNCs versus DCs, and the higher cost of capital for MNCs mainly reflects their higher cost of equity and lower debt ratio. Stock investors perceive a higher risk from multinational operations, and correspondingly ask for different compensation for the funds they provide to MNCs. In contrast, lenders don't perceive any risk difference between MNCs and DCs during the study period, or they don't believe the risk difference is large enough for them to require a higher return. Lenders are less sensitive to benefits and risks from international operation, perhaps because their payoff is less sensitive to the operating activities of business entities (unless the firms are in financial distress), and more dependent on economic conditions and the market interest rate. This observation is consistent with the economically and statistically significant time dummy variables. On the micro level, lenders put more emphasis on the size of the business and how much debt it is already using. The smaller the firm and the more debt is used, the less chance of a problem-free payoff, and lenders therefore require higher return.

6. Robustness checks

The cost-of-debt measure we use is the Treasury spread at the time of a bond's issuance in the primary bond market. An anonymous reviewer asked whether constructing the Treasury spread from TRACE data in the secondary bond market would change our results in section 5. We therefore rerun the models in section 5 after reconstructing the Treasury spread using the bond trade data from TRACE for the firms in our sample, combined with bond maturity information from FISD, the yield on Treasury securities published by the Federal Reserve Bank in its H15 release, and the interpolated yield following the method of Diebold and Li (2006). Since we use firm-year data and TRACE data are not available until July 1, 2002, the study period for this robustness check is 2003–2012. The results regarding cost of debt, cost of equity, and capital structure difference between MNCs and DCs are qualitatively similar: the higher COC for MNCs is due to the higher cost of equity and lower debt ratio, and there is no difference in the cost of debt.

The debt ratio used in this study is market leverage, measured by the ratio of the book value of long-term debt to the sum of the book value of long-term debt and the market value of equity. An observed lower debt ratio might be caused by less use of long-term debt or higher market value of equity. If the negative effect on the ratio is due simply to the increase in market value of equity for more profitable firms, it should disappear when we use book leverage as the debt ratio. We repeat the regression analysis using book leverage, defined as book value of long-term debt divided by total assets. The inferences from the book leverage regressions are the same as the inferences from the market leverage ones, concerning the COC difference between MNCs and DCs, the industry and time effects, the time effect's relationship with real GDP growth rate, and the causes of the higher COC. There is a negative relationship between book leverage and profitability as well as between market leverage and profitability. This indicates that the negative relationship when we use market leverage is not due to the higher market value of equity that more profitable firms tend to have. In general, firms with higher profitability use less debt financing.

This study's conclusions may of course depend on how we define MNCs and DCs. In the analyses above, we define firms in the top quartile of the HHI composite measure of international diversification (described in section 3.2) as MNCs, and firms in the bottom quartile as DCs. As a robustness check, we rerun the regressions, defining the top third as MNCs and the bottom third as DCs, and get qualitatively similar results.

To control survivorship bias, in this study we include all firm-year data that are complete for that year. As a check, we delete from the dataset all data on firms that did not survive through the study period, and rerun the regressions. The results are qualitatively similar.

7. Conclusion

When we control firm size, profitability, leverage, growth opportunities, and income tax rate and consider the industry effect and time effect, we find that U.S.-based MNCs have higher COC than U.S. DCs. The result suggests that international diversification is related to a higher COC, which causes an international diversification discount, all else equal.

We also find a significant time effect: COC decreases over time during the study period, following the trend of the real GDP growth rate. The implication is that the GDP growth rate influences the COC. Relatedly, Chen et al. (1986) and Fama (1990), who focus on cost of equity only, find that stock return is positively related to monthly industrial growth.

Further systematic inquiry shows that the higher COC for MNCs is not due to higher cost of debt. There is no significant difference for MNCs and DCs in cost of debt. The higher COC for U.S. MNCs stems from a higher cost of equity and less use of debt financing, which has lower direct costs. In accord with previous research, we find that capital structure plays an important role in determining COC. Therefore, scholars need to be cautious in relating the COC of a firm directly to the firm's risk level. For MNCs, using more debt is one possible way to lower their COC and increase firm value. Cost of debt changes more actively over time than cost of equity, and firms can more effectively apply market timing to lower the cost of debt and hence the COC.

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