The Causal Relationship between Capital Structure and Cost of Capital: Evidence from ICT Companies Listed at NASDAQ

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April 17, 2006

Abstract

In this study, we intend to examine the Information and Communication Technology (ICT) firms, from a financial perspective. The causal relationship between capital structure and cost of capital is investigated in a simultaneous equation framework. On the one hand, we relate international diversification to the firm's capital structure, and on the other, we test their individual and collective inferences on the combined debt and equity cost of capital. Even though ICT companies are subject to the same market forces as other firms, the rapid development of the industry, complexity of their technologies and presence of the network effect may have valuable implications in determining their financing patterns. Using information pertaining to ICT and non-ICT firms listed on the NASDAQ stock exchange, we expect a negative correlation between international diversification and higher total and long-term debt ratios, and a reduction in the overall cost of capital. Results suggest significant heterogeneity among ICT and non-ICT firms and within each group by a number of firm characteristics.

JEL classification: G32, C33, D21

Keywords: International diversification; Capital structure; Cost of capital; Debt; ICT, NASDAQ

1. Introduction

Information and communication technology (ICT)[1] industries are expected to be subject to the same market forces as every other industry. However, the ICT industries are developed differently with respect to the capital market and growth. Thus, we believe, that some forces, such as the network effect, are particularly important in such industries. In this paper, we attempt to study the ICT sector from a financing point of view, by relating international diversification to the firm's capital structure, and testing their individual and collective inferences on the combined debt and equity cost of capital. One recent study (Hyytinen & Pajarinen, 2005) attempted to study the financing of technology-intensive small businesses by analyzing their capital structure. They find that the leverage ratio of small ICT firms is more conservative than that of other small businesses. To the best of our knowledge, this is the first paper analyzing the relationship between the three aforementioned concepts, namely international diversification, capital structure and cost of capital, in the context of ICT firms.

Extensive research has been performed in the area of international diversification, capital structure, and the cost of capital of non-ICT firms. Prior studies suggest that internationally diversified multinational corporations (hereafter, MNCs) carry less debt than domestic firms (Burgman, 1996; Chen, et al., 1997), and they seem to have a lower cost of debt (Reeb et al., 2001). Moreover, researchers tend to relate the cost of equity to international diversification, while others focus on the relationship between cost of debt and international diversification (Mansi and Reeb, 2002). Only recently have researchers attempted to analyze the weighted average cost of capital, instead of breaking it down into the cost of debt and the cost of equity (Singh and Nejadmalayeri, 2004). Previous studies suggest that greater international activity may lower the risks facing debt holders, due to diversification benefits, despite the fact that it increases the riskiness of equity capital due to risks specific to international operations (Reeb et al. 2001). Moreover, Bodnar and Wong (2000) show that international diversification may result in a reduction in the value of equity call option, leading to a decrease in the cost of debt and an increase in the cost of equity. The net effect on the overall cost of capital will depend on the degree of international diversification and level of debt financing.

In this study, we examine the causal relationship between capital structure and cost of capital of ICT firms in a simultaneous equation framework. We relate international diversification to the firm's capital structure, and test their individual and collective inferences on the combined debt and equity cost of capital. Even though ICT companies are subject to the same market forces as their non-ICT counterparts, the rapid development of the industry, complexity of their technologies and presence of the network effect may have implications of determining their financing patterns. We expect a negative correlation between international diversification and higher total and long-term

[1] In this study we adopt OECD's 1998 definition of the ICT. Accordingly, we distinguish ICT manufacturing industry from ICT service industry. The product of an ICT manufacturing firm must be anticipated to fulfill the purpose of information processing and communication including transmission and display; or use electronic processing to spot, measure and/or record physical phenomena or to control a physical process. Components primarily intended for use in such products are also included. The products of a candidate service industry must be intended to enable the function of information processing and communication by electronic means; and the service provided must go beyond simply the supply of goods.

debt ratios, and a reduction in the overall cost of capital. The data sample used in the empirical analysis represents ICT and non-ICT firms listed on the NASDAQ stock exchange, whilst having financial records on the DataStream database. NASDAQ began trading in 1971; it was the world's first electronic stock market. NASDAQ is now the largest U.S. electronic stock market. With approximately 3,200 companies, it lists more companies and, on average, trades more shares per day than any other stock exchange in the world. It is home to companies that are leaders across all areas of business including technology, retail, communications, services, transportation, media and biotechnology.

The main contribution of this paper lies in testing the theories of capital structure, cost of capital, and international diversification empirically within the ICT sector, and checking whether the uniqueness of the sector has some new implications concerning these theories. The ICT sector is compared with the non-ICT sector to investigate presence of heterogeneity among firms and to identify and quantify the impacts of determinants of the capital market. Further, In order to account for endogeneity and joint determination of the degree of financial leverage and the cost of capital, we use a system of equations jointly estimated. In addition the total debt is further broken down into short term and long term debt components.

Our results suggest significant heterogeneity among ICT and non-ICT firms and within each group by a number of firm characteristics. MNCs demonstrate a higher cost of capital (COC) and lower leverage ratios relative to domestic firms, due to increased systematic risk, as measured by the beta coefficient, and lower levels of tangible assets. Comparing ICT firms to non-ICT, we report that the former have higher COC and lower leverage ratios. Moreover, the results from the regression analysis reveal that international diversification negatively affects leverage and COC.

The paper proceeds as follows. Section 2 provides the theoretical background, covering, the ICT sector, and the relation between international diversification, leverage and cost of capital. Section 3 and 4 describe the data and the methodology used. Section 5 presents the results of the regression analysis. Section 6 concludes the paper.

2. Theoretical Background

This section discusses the theoretical background on which this study is based. Issues, such as, the uniqueness of the ICT sector, international diversification, cost of capital and capital structure of firms, will be addressed. Different factors distinguishing the sector will be defined with their expected effects on the cost of capital and capital structure indicated in parenthesis.

2.1 Uniqueness of the ICT sector

Previous literature confirms the hypothesis that ICT firms tend to rely on internal sources of funds in contrast to outside sources (Dahlstrand & Cetindamar, 2000; Hyytinen and Pajarinen, 2005; Roberts, 1990, 1991). Moreover, empirical results reveal that when using external financing, ICTs prefer equity rather than debt (Hyytinen and Pajarinen, 2005; Moore, 1994; Oakey, 1984; Roberts, 1990, 1991). For instance, Hewlett Packard and Microsoft tend to use their retained earnings rather than debt when financing new investments. According to Varian (2001), the information economy is characterized by certain traits that were uncommon in the industrial economy. We believe that these

characteristics have some bearing on the financial patterns pursued by ICT firms compared with their non-ICT counterparts. The key characteristics with their expected effect on leverage, shown in parenthesis, are listed below[2].

Network effects (-): The network effect causes a product to have a value dependent on the number of customers already owning or using that product. Metcalfe's law (Gilder, 1993) states that the total value of a good or service that possesses a network effect is roughly proportional to the square of the number of customers already owning that good or using that service. The network effect concept was used as justification for some of the business models for dot-coms in the late 1990s.

According to Hyytinen and Pajarinen (2005), the positive feedback effects of a network good increase the under-investment costs of debt and diminish the benefits of debt in limiting the capacity for over-investment. It is difficult to predict the success of an ICT firm in the presence of strong network effects (Schoder, 2000), which usually increases the firm's future cash flow volatility. Such a volatile characteristic of cash flow discourages lenders and decreases a firm's ability to raise debt.

Technicality of the ICT business (-): It is arduous to asses and to understand the business of ICT firms by non-technical people, such as bank clerks, due to the high technicality imbedded in the business of ICTs (Deakins and Hussain, 1993). Moreover, the exact nature of an ICT investment is usually not well defined ex ante (Hyytinen and Pajarinen, 2005) which makes it harder for lenders to finance such projects, therefore, leading to a lower capacity in raising debt.

Intangibility (-): Lenders rely on collateral to secure their loans and to mitigate against adverse selection (Stiglitz and Weiss, 1981), but ICT firms are known to hold low levels of tangible assets, i.e. fewer assets that could be used as collateral. The dependence on intangible assets by technology firms explains why they tend to finance their investment with equity rather than debt (Brealey and Myers, 2000).

Adverse selection (-): Adverse selection is present when the insiders of an ICT firm know more about the probability of the firm's success than outside investors. For instance, it may be difficult to convey the quality of an investment to outsiders due to the confidential nature of the venture (Anton and Yao, 1994), leading to asymmetry in information, thus making it harder for ICT firms to raise debt.

Fixed entry costs vs. low marginal costs (-): The nature of some ICT products, exhibit fixed entry costs and low marginal costs (Varian, 2001). This fact, combined with an aggressive strategy of erecting entry barriers by ICT incumbents, would make the recovery of the fixed entry costs very difficult (Koski and Majumdar, 2002). In such a case, the use of debt becomes unachievable.

2.2 International diversification and cost of capital

The existing literature offers mixed evidence on the cost of capital financing among MNCs. Several factors were identified as having an effect on the cost of capital. The expected effects of the determinants on the cost of capital of firms are indicated in parenthesis after each factor.

[2] We expect a reverse effect on the cost of capital compared to the effect on leverage, i.e. if variable "X" has a positive effect on leverage, it would be expected to have a negative effect on the cost of capital.

Earnings volatility (+): Hughes et al. (1975) argue that since MNCs receive their cash flows from imperfectly correlated markets, they enjoy lower earnings volatility relative to domestic firms. Similarly, Agmon and Lessard (1977) show that the MNC displays more stable earnings than domestic firms, which is recognized by investors as a sign of strength, resulting in a reduced cost of capital.

Risks (+/-): On the one hand, MNCs face social and political risks, unique to the international market, which may be perceived by investors as a sign of weakness or insecurity (Aliber, 1984). These risks may increase the cost of capital. On the other hand, Lessard (1973) argues that international diversification may lead to a reduction in the general risks facing a firm, due to the diversification effect, which will lower the cost of capital.

Internal capital markets (-): Since MNCs operate across countries; they have the ability to create their own internal capital markets, which will provide them with a cheaper source of finance, and lower cost of capital, compared to external markets (Caves, 1971; Doukas and Pantzalis, 2003). Consequently, a non-positive relation is predicted between the firm's foreign operations and leverage when internal capital markets bypass the informational asymmetries of external capital markets (Stein, 1997).

Information asymmetries (+): Based on the Pecking Order Hypothesis, costs related to information asymmetries between the firm's management and its stockholders have a substantial effect on the firm's choice of funding. Information asymmetries create two problems: adverse selection and moral hazard. Adverse selection arises when banks are unable to distinguish between successful and unsuccessful projects because they are incapable of assessing the firm's future prospects (Binks et al., 1992). Furthermore, due to moral hazard, equity holders have an incentive to pursue risky projects, because they stand to gain more than the debt holders if the firm turns successful. This may increase the possibility of bankruptcy.

MNCs may face higher degrees of information asymmetries due to institutional, legal, socio-cultural and political differences across nations (Burgman, 1996). Further, Lee and Kwok (1988) and Doukas and Pantzalis (2003) find that it becomes more difficult to monitor firms once they become internationally active relative to domestic firms. Consequently, bondholders will require higher interest payments on loans to firms that are more susceptible to information asymmetries and which require greater monitoring costs.

2.3 International diversification and capital structure.

The following factors are identified as having an effect on the capital structure of a firm. Some factors are known to increase debt usage while others are known to decrease it. The sign between parentheses indicates the variables expected effect on debt usage.

Growth opportunities (-): Myers' (1977) confers that growth opportunities can be viewed as call options; he also shows that issuing risky debt reduces the present value of a firm holding these options. Thus, firms with greater growth opportunities should be more vulnerable to agency costs of debt. Following that, Kim and Lyn (1986) suggested that MNCs often outperform local companies in host countries and have more growth opportunities; Stulz (1990) and Smith and Watts (1992), show that Firms with profitable growth opportunities may, therefore, use less debt financing. Likewise, Rajan and Zingales (1995) extend this analysis to show that the relation between market leverage

and the market-to-book ratio, a commonly used proxy for growth options, is negative and significant across seven different countries.

Level of intangibility (-): Ethier (1996) and Ethier and Horn (1990) demonstrate that MNCs carry more intangible assets than domestic firms. Knowing that intangible assets could not be used as collateral, it would be sound to assume that debt holders will require higher return on debt, hence discouraging firms from borrowing.

Agency costs (-): Previous literature offers sufficient evidence on the increasing agency costs of debt for MNCs (Myers, 1977; Chkir and Cosset, 2001; Mansi and Reeb, 2002). Burgman (1996) suggests that the debt ratio for MNCs is determined by a tradeoff between the tax advantage of debt and the agency costs of debt. Burgman reports lower debt ratios for MNCs relative to domestic firms. Similarly, Lee and Kwok (1988) and Fatemi (1988) find that MNCs display lower levels of debt financing compared to domestic firms, due to the agency costs of debt.

Foreign exchange rate exposure (+/-): On the one hand, Black (1990) notes that all firms face some level of foreign exchange exposure; however, as firms go international their foreign exchange exposure is exacerbated. Building on that, it would be expected for MNCs to carry more debt in order to hedge against those risks. Chen et al. (1997) conclude that the use of foreign currency-denominated debt to hedge against exchange risks, should lead to a positive relationship between debt ratio and international activities. More recently, Kedia and Mozumdar (2003) argue that due to firms' arbitraging differences in corporate tax rates across countries, they issue debt in the currencies of countries in which they operate to hedge the underlying exposure. On the other hand, the foreign exchange risks lead to increased variability in a firm's domestic currency denominated earnings (Reeb et al., 1998). Increased variability may lead to lower debt ratios.

Coinsurance effect (+): Lewellen (1971) argues that a coinsurance effect would be formed when combining businesses with imperfectly correlated cash flow streams. This effect creates more capacity for debt. Li and Li (1996) show that a firm may face over investment if it is subjected to a combination of diversification and low leverage. Accordingly, diversified firms may have greater debt capacity than non-diversified firms. There is also evidence that diversification across political boundaries reduces risk more than diversification across industries within one country (Heston and Rouwenhorst, 1994). Although Comment and Jarrell (1995) question the robustness of their findings, their empirical results show that leverage ratios average 33–34% in their sample, but increase to 38–40% for the firms with the largest number of business segments. Similarly, Chkir and Cosset (2001) indicate that leverage increases with both international and product diversification, and a combination of both leads to a lower threat of bankruptcy.

3. The Data

3.1 Selection of the Sample

The data set used in this study included 2,782 firms listed on the NASDAQ stock exchange, observed for a period of 10 years from 1995 until 2004. Information on sample firms was extracted from the DataStream (DS) database. The DS database provides operating summaries, annual balance sheets and income statements, sources and uses of funds, growth rates, financial ratios, international business, summary stock data, and

accounting practices on a large set of worldwide firms from different countries of origin. This includes information covering more than 6000 firms from the United States.

From the NASDAQ sample we excluded all regulated utilities, with a Standard Industrial Classification (SIC) code equal to 4900-4999 (Singh et al., 2003), and all financial firms (SIC code equal to 6000-6999), because they are known to have a different financial structure relative to other firms. Moreover, we eliminated those with missing observations essential for the calculation of the dependent variable of cost of capital (COC). For firms with a missing beta, which is one of the main variables in calculating the cost of equity, we used the Value Line (VL) database to fill in the gaps. VL publishes more than a dozen products providing timely information on stocks, mutual funds, special situations, options and convertibles. The final data set used in the empirical part of this study is an unbalanced panel data. It contained 1,763 firms observed consecutively 4-10 years with a total of 17,626 firm-year observations.

The distinction between domestic and MNCs can be based on different measures, for instance Lee and Kwok (1988) and Burgman (1996) used the foreign tax ratio as a proxy for international diversification. In this paper we chose to follow the requirements of the Statement of Financial Accounting Standard No. 14 (FASB 1976), where MNCs are identified as those reporting ratios of foreign assets, foreign sales or foreign income of at least 10%. Firms are classified as domestic if their foreign ratios are less than 10%.

The second key classification is the distinction between ICT and non-ICT firms, which is based on the industrial classification codes reported by the OECD (2000). A number of dummy variables are included in the model specification to account for industry heterogeneity.

Table 1 provides a breakdown of the sample into various categories according to specialization, diversification and industry classification. The share of ICT firms is 38.02%, while the share of international firms is 37.85%. Firms identified as Manufacturing (47.74%), and Services (30.24%) constitute the major industries. Agriculture, Forestry and Fishing (0.49%), Construction (0.59%) and Mining (2.07%) are among underrepresented industries.

3.2 Definition of Variables

A. Dependent Variables

Our two dependent variables are leverage (LV), proxied by the debt ratio, and cost of capital (COC). The most common measure of leverage; is the percentage of total debt to total assets (TD/TA). In order to test the different effects of short-term and long-term debt, we included two additional measures (STD/TA); the ratio of short-term debt to total assets, and (LTD/TA), the ratio of long-term debt to total assets.

In calculating the COC, we used the weighted average cost of capital (WACC), which was found to be the dominant discount rate used in the discounted cash flow (DCF) analysis (Bruner et al., 1998). WACC is calculated based on the following equation:

$$(1) \qquad WACC = (W_{debt}(1-t)K_{debt}) + (W_{equity}K_{equity}) + (W_{preferred}K_{preferred})$$

where K is the component cost of capital, W is the weight of each component as a percentage of total capital and t is the marginal corporate tax rate.

The challenging part of the WACC equation (1) is calculating the cost of equity (K_{equity}). Following Bruner et al. (1998) we used the capital asset pricing model (CAPM), which is found to be the dominant model for estimating the cost of equity. The CAPM depicts that the required return (K) on any asset can be expressed as:

$$(2) \qquad K = R_f + \beta(R_m - R_f)$$

where R_f is risk free rate, $R_m - R_f$ is market risk premium and β is the Beta coefficient.

Bruner et al. (1998) reports that the two mostly used risk-free rates are the 90-day Treasury bill yield and the long-term Treasury bond yield. Long-term bond yields reveal the default free holding period returns existing on long-term investments and thus directly represent the types of investments made by companies. For this study we use the yield on ten-year Treasuries, as reported by the US treasury department, since the yield curve is usually flat beyond ten years.

The financial literature states that the equity market risk premium should be equal to the excess return expected by investors on the market portfolio relative to riskless assets. We use a 7.0% fixed rate following Bruner et al. (1998). Their survey results showed that 37% (highest share) of the corporations surveyed, use the fixed rate approach, and 50% (also highest share) of the financial advisers use the same approach, with a rate of 7.0 to 7.4%.

The equity beta (β) of a stock is its systematic or market risk. A stock's risk can be divided into two parts: systematic and unsystematic. Only systematic risk is priced by the market as investors expect to be compensated for, in terms of additional return. This is because it is easy for investors to diversify their portfolios such that unsystematic risk is washed out. For cost of capital purposes, an estimate of future equity beta is required. The starting point for its estimation, however, necessarily requires the use of historical returns data. The most common approach is to estimate a time series regression of the stock's return relative to the market portfolio. For this paper, we chose to use the Beta published in DS and VL databases. Over half of the corporations and 40% of financial advisers, in Bruner et al.'s (1998) sample rely on published sources for their beta estimates.

The cost of debt component (K_{debt}) for the WACC calculation is easier to estimate than the cost of equity. While the cost of equity is not observable and must be estimated by some economic model, the cost of debt for most companies is readily available. If the company in question has publicly traded debt outstanding, the common method for estimating the nominal cost of debt is to take the current market yield on that debt. For our study we used the cost of debt as reported in the DS database.

The cost of preferred stock ($K_{preferred}$) is the minimum required rate of return that investors require on newly issued preference shares. Due to the unavailability of the data, this component was dropped from our WACC calculation.

B. Explanatory Variables

The following, are a set of explanatory variables recognized in the literature as having possible impacts on capital structure and cost of capital, some of them are included to

capture the international diversification effect, while others are unique to the ICT sector. These variables serve as proxy for the set of factors described in the theoretical background section. They will be used in this study to relate cost of capital and leverage to the degree of international diversification, and to test the difference in financing ICT firms relative to non-ICT. The key variables with their expected effect on leverage shown in parenthesis are listed below. We expect a reverse effect on the cost of capital compared to the effect on leverage.

LSAL (+/-): A proxy for firm size, the log of sales. Several studies suggested that leverage is affected by the size of the firm (e.g., Ang et al., 1982; Titman and Wessels, 1988; Rajan and Zingales, 1995; Lee and Kwok, 1988; Burgman, 1996). On the one hand, size should be inversely related with leverage assuming large firms have greater capacity in their capital markets relative to small firms. On the other hand, large firms reduce bankruptcy risk, thus having a positive effect on leverage (Doukas and Pantzalis, 2003).

ROE5 and SAL5 (-): Following Singh et al. (2003) and Singh and Nejadmalayeri (2004) we measure growth by the 5-year average of the return on equity, and the 5-year average sales growth.

FS/TS (+/-): A measure of the degree of international diversification is included, proxied by the percentage of foreign sales to total sales (Singh and Nejadmalayeri., 2004). Previous literature presents contradicting results concerning the effect of international diversification on firm's leverage. For instance, Singh and Nejadmalayeri (2004), show that internationally diversified firms support higher level of debt financing that directly results in a reduction in the overall cost of capital, while other researchers (Lee & Kwok, 1988; Burgman, 1996; Singh et al., 2003; Fatemi, 1988) provide evidence that MNCs support a lower level of debt financing relative to DCs.

BETA (-): A measure of the firm's systematic risk used by Singh and Nejadmalayeri (2004), and a main component of the weighted average cost of capital. A high beta should lead to low leverage while increasing the overall cost of capital

ATO (+): Asset turnover ratio is a proxy for managerial agency costs, measured by the ratio of sales to total assets. According to Singh and Davidson (2003), a high ATO reflects efficient asset management practices, while a low ratio signals possible asset usage for unproductive purposes. Therefore, firms with considerable agency conflict will have lower asset turnover ratios relative to those having less agency conflict.

NPE/TA (+): Asset tangibility, the ratio of net plant and equipment to total assets, previously used by Johnson (2003) and Singh and Nejadmalayeri (2004). As already mentioned, a higher level of tangible assets implies more assets that can be used as collateral, thus a higher capacity to raise debt.

Finally, we include an ICT-dummy variable, where (ICT) is set equal to 1 if it's standard industrial classification (SIC) code matches OECD's (2000) classification, and a vector of 8 industry dummies, based on the SIC classification, to control for industrial heterogeneity.

4. Methodology

Different approaches and different models have been used to study the capital structure of ICT firms. For instance, Hyytinen and Pajarinen (2005) studied the leverage usage of ICT firms without looking at the effect on the cost of capital, by using a regression equation with only leverage as the dependent variable. Other researchers considered the

cost of equity excluding the cost of debt from their equations, while some studied the cost of debt without taking into consideration the cost of equity.

In this study we tend to identify corporate capital structure and cost of capital differentials across ICT, non-ICT, international, and domestic firms. In order to account for the interdependence between the two endogenous variables, COC and LV, we use a simultaneous equations model estimated by three stage (3SLS) least squares estimation methods. In order to relate leverage and cost of capital to the degree of international diversification we run the following regressions:

(3) $$COC_{it} = F(LV_{it}, X_{it}, X_i, X_t)$$

where COC is a function of a set of variables including but not limited to the Leverage ratio, LV_{it}. The vector X_{it}, represent the determinants of cost of capital, that are firm and time variant, X_i, is a vector of observable firm-specific variables that are constant over time, while X_t, is a vector of time variant determinants that are constant across firms. In addition, dummy variables are included to capture the unobservable firm-specific and time-specific heterogeneity effects. The leverage model is written as:

(4) $$LV_{it} = G\left(COC_{it}, Z_{it}, Z_i, Z_t\right)$$

where Leverage is determined by another set of variables, therefore we set Z_{it} as a vector of the determinants of the leverage variables that are changing both over time and across firms, and include Z_i and Z_t, which are vectors of observable variables in one dimension but constant in another. Moreover, dummy variables are included to capture the unobservable firm-specific, time-specific and other adjustment heterogeneity effects.

Finally, by rearranging equation 3 and 4 and appending an error term (ε_{it}) to them, we use the following equation for COC:

(5a) $$COC_{it} = \alpha_0 + \alpha_{LV} LV_{it} + \sum_j \alpha_j X_{jit} + \sum_s \alpha_s X_{si} + \sum_m \alpha_m X_{mt} + \varepsilon_{it}$$

where Leverage is specified in terms of variables according to the following equation:

(5b) $$LV_{it} = \beta_0 + \beta_{COC} COC_{it} + \sum_j \beta_j Z_{jit} + \sum_s \beta_s Z_{si} + \sum_m \beta_m Z_{mt} + \nu_{it}$$

As previously mentioned we had to account for endogeneity and joint determination of the degree of financial leverage and the cost of capital, thus, we used a system of equations specified as follows:

(6) $$\begin{cases} COC_{it} = \alpha_0 + \alpha_{LV} LV_{it} + \sum_j \alpha_j X_{jit} + \sum_s \alpha_s X_{si} + \sum_m \alpha_m X_{mt} + \varepsilon_{it} \\ LV_{it} = \beta_0 + \beta_{COC} COC_{it} + \sum_j \beta_j Z_{jit} + \sum_s \beta_s Z_{si} + \sum_m \beta_m Z_{mt} + \nu_{it} \end{cases}$$

The system in (6) accounts for joint determination of the two decision variables and their feedback effects. By doing so, one avoids simultaneity and endogeneity biases resulting from estimation of the two decisions (5a and 5b) separately. The two sources of bias have previously been neglected in the literature. The presence of a two way causal relationship between the two decision variables (3SLS) or a recursive one way (2SLS) is statistically testable.

5. Empirical Results

5.1 Descriptive Statistics

Table 2 provides descriptive statistics for the variables used based on the NASDAQ listed sample of 17,626 firm-year observations. The sample is divided into sub-samples of Multinational, Domestic, ICT and non-ICT corporations.

Panel A of Table 2 presents a comparison between international and domestic firms by mean and standard deviation, we also demonstrate the results of the pooled t-test, which measures the significance of the difference between the variables of the two groups. It shows that an average MNC holds more assets, has a larger equity base, generates more sales and creates more income, than a domestic firm, with all four variables having a significant t-test at the 1% level. It seems that the MNC enjoys a higher growth level as evident from the 5-year income growth variable significant at the 1% level. The 5-year sales growth mean variable is higher for domestic firms (22.59) relative to MNCs (21.34), but the difference is not supported by the t-test results. Profitability, as measured by the pre-tax margin, return on assets, 5-year average return on assets, return on equity, and 5-year average return on equity, is also higher for the MNC relative to the domestic firm and significant at the 1% level except for the ROA and ROE ratios which were found to have insignificant mean difference. Moreover, the MNC has a mean beta of 2.08 compared to 1.67 for the domestic firm; therefore, with riskier equity as disclosed by beta, and lower level of tangible assets, as disclosed by the net plant & equipment to total assets ratio (NPE/TA), we should expect a higher cost of capital and lower levels of debt. The results are consistent with our expectations; the MNC's COC is higher than the domestic's by 2.23 percentage points and the leverage ratios, whether measured by total, long-term or short-term debt, are lower. MNCs exhibit better market performance, as measured by the price to book ratio, and the 5-year average price to book ratio. Thus, the results suggest presence of a systematic difference between the MNC and Domestic enterprises and their behavior in the financial market. Moreover, 18 of the 22 variables exhibit highly significant mean differences at the 1% level, while only 4 appear to be statistically insignificants, based on the t-test.

Panel B of Table 2 compares ICT firms to non-ICT by mean and standard deviation of the variables, while showing the mean equality t-test results. ICT firms own more total assets, have a higher equity base, generate more sales and creates more income relative to non-ICT firms. All mean variables appear to be statistically different at the 1% level of significance, except for the sales variable. A low level of tangible assets (16.04 vs. 26.24), as captured by the net plant, property and equipment to total assets variable, combined with a higher beta (2.28 vs. 1.54), would suggest a higher COC and lower debt to assets ratios for ICT firms. Once again, the results are found to be consistent with our expectations. The COC recorded a mean of 17.80 for the ICT sector and a mean of just 13.94 for other sectors combined. The ICT's total debt to assets ratio equals 14.39% compared to 20.01% for non-ICT, similarly the ICT sector demonstrated a lower long-term and short-term debt to assets ratios relative to non-ICT. Moreover, The price to book ratio and the 5-year average price to book ratio show better market performance for the ICT firm relative to other firms. The difference is significant at the 1% level. Looking at profitability ratios, as evaluated by the return on equity, return on assets, 5-year average

return on equity, and 5-year average return on assets, show that non-ICT firms are more profitable and the difference is significant at the 1% level except for the return on assets ratio. The pretax margin shows ambiguous results. As expected, ICT firms exhibit higher growth than non-ICT firms which is displayed by the 5-year sales growth and the 5-year net income growth. The results also show that ICT firms tend to operate in the international level more than non-ICT firms, which is evident by the high FS/TS mean of 23.87 for ICT firms and 11.91 for non-ICT firms, with a mean difference of 11.96, significant at the 1% level.

Table 3 represents the correlation matrix of some of the main variables used in our regression analysis. The sign of the correlation coefficient between two variables shows the direction of correlation. The COC and beta variables are negatively correlated with leverage, an anticipated result, since firms with high systematic risk, as proxied by beta, and high COC, will find it difficult to raise debt. The ICT variable shows significant correlation with leverage (-), COC (+), beta (+), and international diversification (+). Foreign diversification seems to be negatively correlated to leverage, while positively correlated to beta and COC. The asset turnover ratio is correlated positively to leverage and negatively to COC. The BETA-COC and LSAL-ATO pair-wise coefficients are a bit high, which may signal collinearity problem between these variables and a difficulty in separating their effects on cost of capital and leverage.

5.2 Regression Analysis

Our regression analysis includes two sections with two sub-sections each. First, we test the relationship between leverage ratios and international diversification (Table 4, Panel A), followed by an assessment of the relationship between cost of capital and international diversification, for all sectors (Table 4, Panel B). The relations above are tested further based on aggregate, ICT and non-ICT sub-samples. Second, we divide our sample into ICT and non-ICT firms and repeat the previous tests based on total leverage (Table 5, Panel A and B). To account for endogeneity and possible simultaneity, the two equations are estimated using 3SLS estimation methods. It should be noted that the figures in Table 4 and Table 5 are extracted from both the 2SLS and 3SLS regression results. The 3SLS results are used when a two way causal relationship is detected between leverage and COC, while the 2SLS results are used when the causal relationship is just one way, i.e. when leverage affects COC and not the other way around. The nature of the causal relationship between the two variables and estimation method is determined by the significance of the causal factors.

Examining the mean square error (MSE) and the coefficient of determination (R^2), we find that the five models are a good fit. The STD/TA (Model 2), and the LTD/TA (Model 3) models, from the 3SLS results, display a combined MSE of 0.9989, and 1.0087, while exhibiting a combined R^2 of 0.5629, and 0.5802, respectively. The TD/TA model (Model 1), in which the coefficient of COC in the leverage model is insignificant favors a 2SLS method. It exhibits a MSE of 18.7151 and an R^2 of 0.1766 for the leverage equation, while showing a MSE of 4.6520 and an R^2 of 0.7157 for the cost of capital equation. Comparing ICT (Model 5) to non-ICT firms (Model 4), we obtain similar results. Both models are found to be a good fit. The ICT model recorded a MSE of 17.3604 and an R^2 of 0.2613, for the leverage equation, and a MSE of 5.1460 and an R^2 of 0.6912 for the COC equation, suggesting a 2SLS method as the preferred estimation method, while the

non-ICT model registered a combined MSE of 1.0221 and a combined R^2 of 0.5674, for both equations, favoring 3SLS estimation method.

In sum, the models in which leverage is defined by the long term debt ratio (Model 3), and short term debt ratio (Model 2) we observe a two way causal relationship between leverage and cost of capital, while in the remaining model, where leverage is defined as total debt ratio (Model 1) the results suggest a one way causal relationship. In the former, the leverage causes cost of capital, while in the latter cost of capital causes leverage. Chow test (F-test value = 49.22) of aggregate total debt versus a disaggregation of debt into short and long run rejects the null hypothesis of same effects.

A. International Diversification and Leverage.

Table 4, Panel A shows that international diversification (FS/TS) negatively affects leverage, as measured by total and long-term debt to assets ratios, at a 1% level of significance. This may be due to the legal, social, political and foreign exchange risks facing MNCs. Similar results were reached by Shapiro (1978), Lee and Kwok (1988), Burgman (1996) and Chen et al. (1997). Per contra, short-term debt appears to have a positive correlation with international diversification at a 1% level of significance. Fatemi (1988) explains this result by the fact that MNCs have greater access to international money markets and a relative lack of depth in the long-term markets elsewhere.

The cost of capital variable has no significant effect on total debt but negatively affects short-term and long-term debt at a 1% and 10% level of significance, respectively. As the COC increases the firm will find it difficult and expensive to borrow money, thus will be forced to rely on its retained earnings.

The size of the firm, as measured by the log of sales, affects positively the three measures of leverage, so does the firm's tangibility variable, which is measured by the net plant property and equipment to total assets ratio. Both outcomes could be interpreted by the fact that large firms with substantial collateralized assets attract more debt than smaller firms with a larger base of intangible assets.

Fast growing firms with highly profitable projects are more likely to depend on equity rather than debt (Rajan and Zingales, 1995). Consistent with the theory the two growth proxies, 5-years sales growth and 5-years return on equity, show a negative relation with leverage, noting that (ROE5) is significant at a 1% level for the three measures of leverage, while (SAL5) was found to have insignificant effect on short- term debt.

Examining the industry dummies, we find that industries like mining, manufacturing, and retail trade have a highly significant lower total and long-term debt ratios relative to the reference industry (agriculture, forestry and fishing), while showing no significant difference for the short-term debt ratio.

B. International Diversification and Cost of Capital

The international diversification variable appears to have a negative relation with COC, which is consistent with the results reached by Reeb et al. (2001), and Kim and Stulz (1988) (Table 4, Panel B).

Significant at 1% level, the COC appears to decrease as total and long-term debt increase. Here we should expect the COC to increase, whenever one of the right hand side variables of the WACC equation (1), increases, so if the leverage ratio increases the

COC is also expected to increase; but if we are to compare the change in the COC variable due to a change in leverage relative to a change in equity we should expect a lower change in the COC, since the cost of debt is always lower than the cost of equity. The short-term debt to total assets ratio seems to have no significant effect on the cost of capital. As expected the beta variable is positively related to the COC, at 1% level of significance. Firms with a high systematic risk require a higher returns on equity, as a result, the increase in the cost of equity component of the equation, raises the overall COC.

The literature provides ample evidence on the relation between agency costs and debt financing. Lee and Kwok (1988), and Chen et al. (1997) demonstrate that higher agency costs lead to lower debt ratios. Accordingly, we would expect a positive relation between agency costs and COC. High agency costs between managers and shareholders, would increase the cost of equity, whereas between managers and debt holders, would increase the cost of debt, consequently, increasing the overall COC. Our agency cost measure (ATO) was found to be negatively related to the COC because a high asset turnover ratio reveals managerial efficiency in utilizing corporate assets, reflecting lower managerial agency problem leading to low levels of COC.

A large firm signals strength and future growth, subsequently lenders would be willing to ask for a lower cost of debt. Lowering a firm's cost of debt, would eventually reduce the overall COC. Our proxy for size (LSAL) has a significant negative impact on the COC. Most of the industrial sector dummy coefficients were found to be statistically insignificant suggesting no systematic industry heterogeneity in the cost of capital.

C. ICT firms vs. non-ICT firms

We first conducted a Chow test, in order to check for equality between the pooled model (Model 1 in Table 4) and the ICT (Model 4) and non-ICT models (Model 5) separated (Table 5). The results, not reported here for brevity, for both equations (COC and Leverage) were rejected with an F-value of 23.1 for the leverage equation and an F-value of 70.85 for the COC equation. We conclude, that it is rational to separate the two models and to look at the difference between the variables' effect.

The results reported in Panel A of Table 5 show, that as the cost of capital increases for non-ICT firms, leverage is expected to decrease, i.e. showing a negative relation between COC and leverage significant at the 10% level. Under the ICT model the COC seems to have no effect on leverage suggesting a one way causal relationship from debt to cost of capital. The capacity to raise debt increases with firm size, for both sectors, but with different levels of significance, 1% for non-ICT and 5% for ICT. As already mentioned, ICT firms rely more on internal financing and prefer to issue stocks rather than bonds, this applies to small, medium and large firms. Moreover, the growth in return on equity and the growth in sales variables, appear to have the same negative effect on leverage for both ICT and non-ICT sectors, significant at the 1% level. This could be explained by the fact that shareholders would prefer to use internal financing if they expect high returns on equity and a growth in sales. As expected the tangibility variable, measured by NPE/TA, positively affects leverage in all sectors at a 1% level of significance.

One major difference between ICT and non-ICT firms is noticed in the coefficient of the international diversification variable. The FS/TS variable negatively affects leverage at 1% significance level for non-ICT firms, while having insignificant impact on leverage

within the ICT sector. Leverage seems to be lower for ICT and non-ICT firms in the manufacturing, wholesale trade, and services sector compared with other sectors.

Looking at Table 5 Panel B, the COC appears to increase as leverage decreases, significant at 1% and 5% levels for non-ICT and ICT firms, respectively. As anticipated, the international diversification variable is negatively related to the cost of capital for all sectors at the 10% level of significance. The firm's systematic risk, as measured by beta, has a positive effect on COC, at 1% level of significance. It makes no difference whether the firm is an ICT firm or not, a higher beta leads to higher COC. Size seems to have a negative effect on the COC for non-ICT firms significant at the 1% level, while records insignificant effect in the ICT sector. Moreover, the Asset Turnover Ratio (ATO) was found to be negatively related to the COC significant at the 5% level for ICT firms, while showing no significant effect under the non-ICT sector.

In order to compare international ICT firms to domestic ICT firms we added one more heterogeneity test. The results, not reported for brevity, indicate that international ICT firms are stronger relative to their national counterparts, in terms of growth, profitability, and market performance. However, international ICT firms possess higher systematic risks, higher cost of capital, and lower leverage ratios.

6. Conclusion

This study examines the relationship between International diversification, capital structure, and cost of capital, while comparing ICT to non-ICT firms and short term to long-term debt. Specifically, we analyze the effects of International diversification on the leverage and cost of capital of 1,763 ICT and non-ICT firms listed on the NASDAQ stock exchange over the 1995-2004 period. The aim of this paper is to provide deeper insight regarding ICT firm's leverage behavior, which is the major industrial sector in the so called new economy.

The results show that international diversification negatively affects leverage and the cost of capital. This may be due to the legal, social, political and foreign exchange risks facing a MNC. Moreover, we report an inverse relation between the cost of capital and leverage. By increasing leverage the firm's cost of capital decreases, owing to the fact that the cost of debt is usually lower than the cost of equity; accordingly, higher levels of debt would abate the weighted average cost of capital. Another explanation might be the unit cost of debt is declining in the level of debt.

Comparing ICT firms to non-ICT firms, our results are found to be consistent with previous literature. ICT firms rely more on equity financing as evident by lower debt to assets ratios and a higher equity base. Moreover, several studies have shown that equity is the preferred funding choice for technology based firms, some argue that this is due to the pursuit of innovation (Roberts, 1991), others provide evidence showing that the pursuit of wealth is another important factor (Amit et al., 2001).

Our findings have some policy implications. The fact that ICT firms have higher, beta, intangible assets and COC coefficients, combined with a preference towards equity financing, debt financing would be a last resort solution. The US is known to have a well-developed venture capital and informal equity markets. We believe that policy makers should keep on promoting such markets; this would ensure financing ICT firms, especially small and start-up firms. Moreover, in many countries governments support ICT firms by providing debt-related subsidies, which based on the results of this paper

may hinder investment in ICT instead of boosting it. We believe that public policy makers should enhance the availability of equity capital instead of providing subsidized debt finance for investment.

Based on the comparison between international ICT firms and domestic ICT firms, we believe, that ICT firms will perform better if they were to operate on the international level, because the ICT firm's performance is dependent on its ability to create standards. Having access to the international market will definitely increase a firm's chances in creating and maintaining a standard. For instance, Microsoft's success is directly related to its ability in turning Windows into an international standard.

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Table 1: Frequency Distribution of firms.

Variable	Frequency	Percent	Cumulative Frequency	Cumulative Percent
A. Specialization:				
Non-ICT firms	10925	61.98	10925	62.98
ICT firms	6701	38.02	17626	100.00
B. Diversification:				
Domestic firms	10954	62.15	10954	62.15
International firms	6672	37.85	17626	100.00
C. Industry Classification:				
Agriculture, Forestry and Fishing	86	0.49	86	0.49
Mining	364	2.07	450	2.55
Construction	104	0.59	554	3.14
Manufacturing	8415	47.74	8969	50.89
Transportation Communication	1249	7.09	10218	57.97
Wholesale Trade	786	4.46	11004	62.43
Retail Trade	1292	7.33	12296	69.76
Services	5330	30.24	17626	100.00

Note: The Industry Classification is based on the two-digit Standard Industrial Classification (SIC) Code, were ICT firms are defined as those with an SIC code equal to 3357, 3571, 3572, 3575, 3577, 3651, 3661, 3663, 3671, 3672, 3699, 3823, 3825, 3826, 4812, 4813, 4822, 4832, 4833, 4841, 4899, 5045, or is between 3577-3579 or 3674-3679 or 7371-7379. All other SIC codes belong to the non-ICT sector. Domestic firms are defined as those with a foreign sales to total sales ratio (FS/TS) of less than 10%, while International firms are those with a (FS/TS) of greater than or equal to 10%. Agriculture, Forestry and Fishing firms are those with an SIC code less than 999, Mining firms (1000-1499), Construction firms (1500-1999), Manufacturing firms (2000-3999), Transportation Communication (4000-4900), Wholesale Trade (5000-5199), Retail Trade (5200-5999), Services (7000-8999).

Table 2: Summary statistics by diversification and specialization (1995-2004).

Panel A: Diversification

		MNC		Domestic		
Variable	Description	Mean	Std Dev	Mean	Std Dev	Pooled t-Test
A. Dependent variables:						
COC	Cost of Capital	16.79	8.99	14.56	8.67	-16.35a
TD/TA	Total Debt to Total Assets	14.93	19.13	19.68	21.64	14.38a
STD/TA	Short-term Debt to Total Assets	4.07	8.78	4.90	10.09	5.56a
LTD/TA	Long-term Debt to Total Assets	10.86	17.37	14.78	19.85	13.33a
B. Independent variables:						
BETA	Beta	2.08	1.29	1.67	1.22	-21.79a
SAL5	Sales Growth 5-years	21.34	38.38	22.59	43.80	1.93
NI5	Net Income 5-years	11.87	30.17	5.84	16.13	-17.28a
PTAX	Pretax Margin	7.41	14.44	1.85	12.07	-27.52a
ROA5	Return on Assets 5-years Average	4.65	8.82	4.18	8.52	-3.49a
ROA	Return on Assets	6.06	12.30	5.77	12.14	-1.57
ROE5	Return on Equity 5-years Average	7.42	17.66	6.19	16.07	-4.73a
ROE	Return on Equity	9.39	22.43	9.06	22.92	-0.94
FS/TS	Foreign Sales to Total Sales	42.26	24.87	0.75	2.13	-173.9a
P/B	Price to Book	3.42	2.86	3.17	2.83	-5.48a
P/B5	Price to Book 5-years Average	3.43	2.70	3.00	2.65	-10.36a
NPE/TA	Net Plant & Equipment to Total Assets	17.40	15.35	25.39	23.03	25.17a
ATO	Asset Turnover Ratio	45.41	11.09	41.33	15.88	-18.46a
TA	Total Assets	1003357.14	4305077.86	394113.54	3086278.57	-10.92a
CE	Common Equity	554668.33	2674001.31	173396.35	116293.12	-13.05a
SAL	Sales	896895.85	4790179.45	333717.46	1457860.05	-11.48a
NI	Net Income	64313.968	448915.69	15737.76	260734.79	-9.09a

Note: Panel A shows the summary statistics by diversification, were MNC are multinational corporations with a FS/TS ratio greater than or equal to 10%, while domestic, represent firms with a FS/TS ratio less than 10%. We included a T-test to check the significance of the difference in mean variable between groups of firms. Panel B shows the summary statistics by specialization, were ICT are firms belonging to the information and communication technology sector as categorized by OECD (2000), based on their SIC codes. Non-ICT firms comprise all other firms.

Table 2: continued.

Panel B: Specialization

		ICT		NON-ICT		
Variable	Description	Mean	Std Dev	Mean	Std Dev	Pooled t-Test
COC	Cost of Capital	17.80	9.45	13.94	8.14	-28.79a
TD/TA	Total Debt to Total Assets	14.39	20.55	20.01	20.73	17.99a
STD/TA	Short-term Debt to Total Assets	4.09	9.74	4.88	9.54	5.26a
LTD/TA	Long-term Debt to Total Assets	10.30	18.71	15.13	19.01	16.47a
BETA	Beta	2.28	1.30	1.54	1.15	-39.45a
SAL5	Sales Growth 5-years	26.92	44.89	19.18	39.57	-11.99a
NI5	Net Income 5-years	9.18	25.34	7.48	20.87	-4.85a
PTAX	Pretax Margin	4.21	15.85	3.80	11.46	-2.03b
ROA5	Return on Assets 5-years Average	3.84	9.20	4.67	8.26	6.24a
ROA	Return on Assets	5.76	13.69	5.95	11.19	0.97
ROE5	Return on Equity 5-years Average	5.94	18.14	7.09	15.74	4.48a
ROE	Return on Equity	8.40	23.63	9.66	22.16	3.58a
FS/TS	Foreign Sales to Total Sales	23.87	27.74	11.91	22.59	-31.27a
P/B	Price to Book	3.71	3.04	2.99	2.68	-16.47a
P/B5	Price to Book 5-years Average	3.77	2.85	2.79	2.49	-23.83a
NPE/TA	Net Plant & Equipment to Total Assets	16.04	16.24	26.24	22.33	32.50a
ATO	Asset Turnover Ratio	44.01	12.51	42.18	15.39	-8.23a
TA	Total Assets	904420.84	5119904.34	453491.94	2208404.07	-8.07a
CE	Common Equity	493643.73	2833277.12	210011.35	911113.97	-9.69a
SAL	Sales	581346.89	2715154.49	525618.01	3424575.05	-1.13
NI	Net Income	57196.51	545408.89	20000.77	97211.49	-6.96a

Note: Significant at the less than 1% (a), 1–5% (b) and 5–10% (c) levels of significance

Table 3: Pearson correlation coefficients.

	YEAR	TD/TA	COC	BETA	ATO	LSAL	ROE5	FS/TS	NPE/TA	ICT
YEAR	1									
TD/TA	-0.0134 0.0741	1								
COC	-0.0654 0.0001	-0.1814 0.0001	1							
BETA	0.0218 0.0037	-0.0919 0.0001	0.7825 0.0001	1						
ATO	-0.0328 0.0001	0.0546 0.0001	-0.1461 0.0001	-0.1489 0.0001	1					
LSAL	0.0676 0.0001	0.1562 0.0001	-0.1565 0.0001	-0.1162 0.0001	0.6113 0.0001	1				
ROE5	-0.0798 0.0001	-0.0102 0.1773	-0.1391 0.0001	-0.1586 0.0001	0.2250 0.0001	0.2504 0.0001	1			
FS/TS	0.0789 0.0001	-0.0664 0.0001	0.1187 0.0001	0.1592 0.0001	0.0859 0.0001	0.1727 0.0001	0.0398 0.0001	1		
NPE/TA	-0.0688 0.0001	0.3319 0.0001	-0.2035 0.0003	-0.2057 0.0001	0.1406 0.0001	0.1449 0.0001	0.0729 0.0001	-0.1376 0.0001	1	
ICT	0.0283 0.0001	-0.1342 0.0001	0.2117 0.0001	0.2846 0.0001	0.0618 0.0001	0.0331 0.0001	-0.0337 0.0001	0.2291 0.0001	-0.2376 0.0001	1

Note: The p-value is shown under the Coefficient. Glossary of the variables is given in previous tables and a full description of the variables is included in the text.

Table 4: Three Stage Least Squares estimation of the relationship between International Diversification, Leverage Ratios and Cost of Capital, by type of debt.

Panel A: Leverage

		Total Debt (Model 1)		Short-term Debt (Model 2)		Long-term Debt (Model 3)	
Variable	Description	Estimate	t-value	Estimate	t-value	Estimate	t -value
INTERCEPT	Intercept	-1.0665	-0.4300	15.2409a	12.7600	-13.3776a	-5.7700
COC	Cost of Capital	…	…	-0.0418a	-3.6900	-0.0374c	-1.7000
LSAL	Log of sales	0.6907a	6.4600	0.5489a	10.7800	0.0837	0.8500
ROE5	Return on Equity 5-years average	-0.0931a	-10.0000	-0.0269a	-6.1000	-0.0714a	-8.3300
SAL5	Sales Growth 5-years	-0.0146a	-4.0200	-0.0027	-1.5500	-0.0103a	-3.0800
FS/TS	Foreign Sales to Total Sales	-0.0201a	-3.1100	0.0248a	8.0900	-0.0359a	-6.0400
NPE/TA	Net Plant & Equipment to Total Assets	0.2691a	31.1500	0.0415a	10.1500	0.2408a	30.2600
SIC2	Mining	-10.0821a	-4.1800	-1.4940	-1.3200	-8.1328a	-3.6900
SIC3	Construction	2.3434	0.8100	0.9433	0.6900	1.2730	0.4800
SIC4	Manufacturing	-7.2747a	-3.3300	-0.5230	-0.5100	-6.7787a	-3.4000
SIC5	Transportation Communication	5.5528b	2.4700	0.9825	0.9300	4.9358b	2.4000
SIC6	Wholesale Trade	-1.6065	-0.7000	2.6150b	2.4300	-3.8049c	-1.8200
SIC7	Retail Trade	-11.2580a	-5.0300	-0.3070	-0.2900	-10.6580a	-5.2100
SIC8	Services	-7.1234a	-3.2500	-0.2422	-0.2300	-6.7521	-3.3700
MSE	Weighted Mean Square Error	18.7151		…		…	
R2	Weighted R-Squared	0.1766		…		…	

Note: Significant at the less than 1% (a), 1–5% (b) and 5–10% (c) levels of significance

Table 4: Continued

Panel B: Cost of Capital

		Total Debt (Model 1)		Short-term Debt (Model 2)		Long-term Debt (Model 3)	
Variable	Description	Estimate	t-value	Estimate	t-value	Estimate	t -value
INTERCEPT	Intercept	6.0865a	10.1500	5.3328a	8.4100	5.9895a	10.2000
TD/TA	Total Debt to Total Assets	-0.0356a	-4.8200	…	…	…	…
STD/TA	Short-term Debt to Total Assets	…	…	0.0241	0.8500	…	…
LTD/TA	Long-Term Debt to Total Assets	…	…	…	…	-0.0436a	-5.5200
LSAL	Log of Sales	-0.0850a	-3.3700	-0.1316a	-4.8400	-0.0558b	-2.0600
BETA	Beta	2.9942a	60.5700	3.0107a	60.0300	3.0292a	61.9000
ATO	Asset Turnover Ratio	-0.0020c	-0.5900	-0.0025c	-0.5500	-0.0065c	-1.8600
FS/TS	Foreign Sales to Total Sales	-0.0006c	-0.3600	-0.0001c	-0.0100	-0.0012b	-0.7300
SIC2	Mining	-0.4166	-0.7000	-0.2168	-0.3600	-0.3987	-0.6700
SIC3	Construction	-0.1588	-0.2200	-0.1431	-0.2000	-0.1927	-0.2700
SIC4	Manufacturing	-0.1011	-0.1800	0.3814	0.7000	-0.1489	-0.2700
SIC5	Transportation Communication	-0.6225	-1.1100	-0.8465	-1.5100	-0.6019	-1.0900
SIC6	Wholesale Trade	-0.3839	-0.6700	-0.0887	-0.1600	-0.5338	-0.9400
SIC7	Retail Trade	0.0715	0.1300	0.5544	0.9900	-0.0051	-0.0100
SIC8	Services	-0.4257	-0.7700	0.0728	0.1300	-0.4853	-0.8900
MSE	System Weighted Mean Square Error	4.6520		0.9989		1.0087	
R^2	System Weighted R-Squared	0.7157		0.5629		0.5802	

Note: Significant at the less than 1% (a), 1–5% (b) and 5–10% (c) levels of significance

Table 5: Three Stage Least Squares estimation of the relationship between International Diversification, Leverage Ratios and Cost of Capital, by Specialization.

		NON-ICT (Model 4)		ICT (Model 5)	
Variable	Description	Estimate	t Value	Estimate	t Value
Panel A : Leverage					
INTERCEPT	Intercept	-4.3582	-1.5200	12.2370a	5.9100
COC	Cost of Capital	-0.0557c	-1.6700	…	…
LSAL	Log of sales	0.8522a	6.7300	0.4691b	2.0300
ROE5	Return on Equity 5-years average	-0.0876a	-6.6900	-0.0761a	-5.9200
SAL5	Sales Growth 5-years	-0.0193a	-3.8700	-0.0116b	-2.2200
FS/TS	Foreign Sales to Total Sales	-0.0296a	-3.2200	0.0045	0.5200
NPE/TA	Net Plant & Equipment to Total Assets	0.2416a	23.1700	0.3491a	21.5600
SIC2	Mining	-9.0680a	-3.6600	…	…
SIC3	Construction	1.7682	0.5900	…	…
SIC4	Manufacturing	-6.7809a	-3.0200	-19.8169a	-23.3200
SIC5	Transportation Communication	-4.6425c	-1.9200	…	…
SIC6	Wholesale Trade	-3.1062	-1.3100	-7.3025a	-3.7200
SIC7	Retail Trade	-11.5619a	-5.0200	…	…
SIC8	Services	-6.2823a	-2.7700	-19.1143a	-21.7400
MSE	Weighted Mean Square Error	…		17.3604	
R2	Weighted R-Squared	…		0.2613	
Panel B : Cost of Capital					
INTERCEPT	Intercept	6.3488a	10.9000	4.8962a	7.5800
TD/TA	Total Debt to Total Assets	-0.0407a	-4.7500	-0.0296b	-2.3800
LSAL	Log of sales	-0.1346a	-4.4200	-0.0273	-0.6300
BETA	Beta	3.0406a	48.6300	2.9251a	36.2000
ATO	Asset Turnover Ratio	0.0055	1.3600	-0.0131b	-2.1300
FS/TS	Foreign Sales to Total Sales	-0.0005c	-0.2400	-0.0019c	-0.7300
SIC2	Mining	-0.4659	-0.8400	…	…
SIC3	Construction	-0.1435	-0.2100	…	…
SIC4	Manufacturing	-0.3450	-0.6700	1.3308a	3.3500
SIC5	Transportation Communication	-0.1457	-0.2700	…	…
SIC6	Wholesale Trade	-0.3963	-0.7400	0.4609	0.7800
SIC7	Retail Trade	0.0362	0.0700	…	…
SIC8	Services	-0.2750	-0.5300	…	…
MSE	System Weighted Mean Square Error	1.0221		5.1460	
R^2	System Weighted R-Squared	0.5674		0.6912	

Note: Significant at the less than 1% (a), 1–5% (b) and 5–10% (c) levels of significance. For non-ICT firms the reference industry used is industry 1 (agriculture, forestry and fishing), while for the ICT firms, the reference industry is a combination of excluded industries 2, 3, 5 and 7.