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FINANCIAL ECONOMICS | ARTICLE

Intangible investments and cost of equity capital: An empirical research on Vietnamese firms

Trinh Hiep Thien¹ and Nguyen Xuan Hung¹*

Abstract: Together with the development of knowledge-based economy, investment in intangibles has been dramatically increasing. Although intangibles are widely recognized as primary value drivers for more firms, as evidence of many studies related to the value relevance or the market valuation of intangible investments, little is known in the literature about the cost of equity capital for financing intangible investments, especially in Vietnamese literature extent. This paper's aim is therefore to empirically investigate the association between a firm's cost of equity capital and intangible investments detailed by research and development investment, business combination investment and organizational capital investment. We investigate the above relationship through the sample of 120 Vietnamese-listed firms from 2013-2017. Regression result confirmed that both higher level of research and development investment and larger amount of accounting goodwill raise the firm's overall cost of equity capital since their characteristics of these investments are riskier and less liquid and has a higher level of information asymmetry. Our findings could suggest several implications for managers and shareholders in making their investment decisions. Once again, this study adds to the existing business valuation literature by providing additional evidence of the impact of research and development investment as well goodwill on accounting for equity capital valuation.

Subjects: Public Finance; Corporate Finance; Investment & Securities

Keywords: intangible investments; cost of equity capital; research and development investment; organizational capital investment

JEL codes: G10; M10; M41

1. Introduction

There can be little argument that the world's economy has shifted, and is continuing to shift, from an economy driven by the use of tangible assets such as plant, equipment, and real estate to an economy driven by the use of intangible assets such as knowledge, human, technology, core competencies and innovation (Meritum Project, 2002). Due to the recent movement toward the era of "knowledge-based economy", over the last decade or so, investments in Vietnam aimed at creating intangibles such as human capital, brands, business processes, and know-how, have significantly increased. Although research in the extant literature has primarily focused on the value relevance and the market valuation of intangible investments (e.g., Hall et al. (1984), Lev and Sougiannis (1996), Lev (2001), and Lev and Radhakrishnan (2003); Geng, Zhang, & Zhou (2020); Barker, Lennard, Penman, Teixeira, (2021); Güleç, (2021), the cost of equity capital for intangible investments remains empirically





under-explored. More specially, Vietnamese empirical cross-sectional studies of the cost of equity capital for intangible investments are scarce probably due to two main difficulties. Firstly, Vietnamese enterprises often do not provide a comprehensive account for intangible investments. Much of the expenditures in this category are expensed rather than capitalized. Disclosure on those expenditures is also severely inadequate. Secondly, Vietnamese firms generally do not raise external capital against individual intangible investment projects but instead allocate capital to them. On the other hand, the authors may not work on the concept of intangible investments in general because intangible investments are the pool of investment activities of intangibles. Therefore, this paper identifies three critical groups of intangible investments, those are research and development (R&D) investment, business combination investment and organizational capital investment. R&D investment making competitive advantages and business combination investment generating synergies should be separately identified in the pool of intangible investments. The rest of intangible investments are included in the concept of organizational capital investment. These components are inherently unobservable and it is hard to evaluate the cost of equity capital for each intangible investment project, the cost of equity capital for intangible investments is assessed through their marginal impact on firms' overall cost of equity capital (Lev and Radhakrishnan (2003), Shangguan (2005), and Shirabe (2015); Geng, Zhang, & Zhou (2020); Barker, Lennard, Penman, Teixeira, (2021); Güleç, (2021)).

The cost of equity capital is the rate of return on an investment required by equity investors. The literature has identified three fundamental determinants of the cost of equity capital: riskiness, information asymmetry, and liquidity. These theories constitute the framework for this study in terms of the cost of equity capital for intangible investments. As Sharpe (1964) holds that, in an informationally efficient market, the cost of equity capital of a firm is positively dependent on its systematic risk. Although the cost of equity capital of a project or a division is likely to differ from the firm's overall cost of equity capital, Gorton and Halpem (1974) suggest that if a project's systematic risk varies, a project's and a firm's cost of equity capital is also influenced. It means that if a project's systematic risk is higher than the original overall systematic risk of the firm, the firm's overall cost of equity capital will be raised (Gorton & Halpem, 1974). In addition to the determinant of riskiness, Sharpe (1964) indicates that a crucial assumption of the capital asset pricing model is that the capital market is informationally efficient. When the issue of information asymmetry is existing in the capital market, the outsiders will require a higher rate of return for holding the firm's stock (Easley et al., 2002). Similar to the issue of riskiness and information asymmetry, the cost of equity capital is also affected by asset liquidity (Amihud & Mendelson, 1986). The higher the degree of information asymmetry is, the lower price investors are willing to pay for the asset, hence the more illiquid it will be. Here, the authors recognize that all three components of intangible assets have their characteristics in terms of high riskiness, high information asymmetry and low liquidity. All of the above discussion inspires us to predict that a firm's intangible investments, detailed by research and development investment, business combination investment and organizational capital investment are probably positively influence a firm's cost of equity capital. Unlike the prior research, which is primarily devoted to demonstrating the positive role of intangible investments in creating firm value, this study provides insight into the discount rates being used by investors in valuing diverse types of intangible investments. In other words, for firms displaying underinvestment in intangibles, this research provides evidence as to whether the cost of equity capital might be a reason. To the best of our knowledge, there are currently no studies that directly investigate the link between intangible assets and a firm's cost of equity capital in Vietnamese context.

Next section briefly presents literature review to develop a set of hypotheses. The sample and variables measurement are detailed in the next section in terms of methodology. Lastly, it also recaps the results of regression analysis with balanced panel data before detecting this study's contributions, implications and suggesting some avenues for further research.

2. Literature review and hypothesis development

Intangible investments studied in this paper refer to any resources usage in order to create intangibles assets, which are non-physical sources of probable future economic benefits to an entity. In other words, intangible assets are all of the elements of an enterprise that exist in addition to monetary and tangible assets. According to the Organization for Economic Cooperation and Development (OECD), it determines six categories of investment activities as the components of intangible investments (Young, 1998), including (1) computer-related; (2) production and technology; (3) human resources; (4) organization of the firm; (5) externals; (6) industry-specificity. However, to accomplish the goal of this study, a simple classification of intangible investments is adopted. Intangible investments identified three categories of investment activities. Those are research and development (R&D) investment; merger and acquisition activities via the amount of accounting goodwill; and all other intangible investment activities under one common name: organizational capital investment.

This study is grounded on three underlying financial theories on the cost of equity capital. Firstly, according to the conventional capital asset pricing model, the cost of equity capital is commensurate with a firm's systematic risk level (Fama & French, 1992). Secondly, the cost of equity capital is determined by the extent of information asymmetric between a firm's externals and internals (Akerlof (1970); Healy and Palepu (2001)). Thirdly, the cost of equity capital is determined by the liquidity of assets, with investors requiring a liquidity premium for illiquid assets (Acharya & Pedersen, 2005). Based on this analysis, the cost of equity capital for intangible investments is focused on examining their characteristics in terms of riskiness, information asymmetry and liquidity.

Many entities spend substantial amounts on research and development activities to improve its current performances, and investments for such activities are, therefore, important to generate intangibles. Research is defined as original and scheduled investigation undertaken with the possibility of achieving new technical or practical knowledge and insight (IAS 38). According to IAS 38, development is defined as the product of research findings or other knowledge to design for the production of new or substantially improved material, processes, systems before the start of commercial production or usage. It is commonly believed that R&D activities are highly risky, thus, international accounting standard 38 does not permit to capitalize the expenditure of the research phase. R&D investment is highly risky not only because its outcome is highly uncertain, but also because firms may not exactly evaluate the benefits from the investment even after the benefits become eminent (Webster, 2002). For example, knowledge generated from R&D often is "tacit" to be embedded in the human capital and it will be lost together with the departure of key employees. In addition to riskiness, the inventive process of R&D creates an important level of information asymmetry between inside and outside investors (Shangguan, 2005). Assessing the quality of an R&D project, for example, demands a substantial amount of specialized knowledge that outside investors usually do not possess (Shangguan, 2005). Because of a high level of information asymmetry around R&D investment, investors' beliefs about its value are likely to be more dispersed, making the outcomes of R&D activities more difficult to trade (Boone & Raman, 2001). For instance, a piece of equipment is sold and can be resold at market price; however, the results of R&D investment are illiquid because the lack of direct measures of R&D outputs (Griliches & Mairesse, 1995). Although the trade volume of either patented or non-patented technologies has grown recently, a well-organized market is still absent (Gu & Lev, 2001). To sum up, relative to intangible investments, since R&D investment is highly risky, informationally asymmetric, and less liquid, investors demand a premium, which increases the firm's cost of equity capital (Chaudhry et al., 2017; Huang & Liao, 2018; James & McGuire, 2016; Lee & Lee, 2019; Li & Ryan, 2022; Magerakis et al., 2022; Resutek, 2022; Yang & Lai, 2021). This leads to the following hypothesis:

 H_{1a} : The firm's cost of equity capital is positively associated with R&D investment level.

Many prior studies about the economic effects of accounting goodwill have focused on the value relevance of goodwill, and there are little study that directly investigate the relation between goodwill and cost of capital (Christodoulou et al., 2016; Landsman, 2007; Mazzi et al., 2017). The goodwill is classified into two categories, including internal goodwill which is internally generated by business operation and external goodwill which is acquired in merger and acquisition or business combination. This paper centered on external goodwill as a distinctively identified variable because a firm's internal goodwill is included in organizational capital investment. When merger and acquisition deal is executed, the acquirer recognizes goodwill which is measured as the excess of the proceedings over fair value of assets and liabilities acquired in the business combination. All merger or acquisition deals are undertaken once managers predicted that synergies may be acquired from business combination (Landsman, 2007). However, there is the probability of failure in business combination when synergies may not be acquired after consolidation. Therefore, an acquiring firm's shareholders often evaluate that business combination is one of risky investments due to its uncertainty of future excess profit. Moreover, the managers of acquiring firm estimate the future excess profit, which is expected from this deal, mainly based on the subjective information that is unobservable from outsiders (Shirabe, 2015). Penman (2007) indicates that there is greater information asymmetry between managers and investors as it is difficult for investors to validate the managers' fair value measurement of an acquired firm's assets and liabilities. Therefore, since accounting goodwill is recognized as an asset reflecting the future excess profit from business combinations, the larger the amounts of goodwill are recorded on the balance sheet, the greater information asymmetry for acquiring firm is presented (Beyer, 2018; Chen et al., 2018; Lambert et al., 2007). With regards to the liquidity of business combination investment, the amount of external goodwill may be traded by re-selling of an acquired firm, but this transaction is less liquid (Shirabe, 2015). The first reason is that it is difficult to find the acquiring and acquired firms of a merger and acquisition deal. The business combination deal is only traded when acquiring and acquired firms are looking for their compatible demand mutually. The second reason is that paying a large amount of expenditure on re-acquisition of an acquired firm is a tough decision. In case the acquired company is well-developed, the re-acquisition firm must agree with an extremely high price because the parent company is not willing to sell its subsidiary. Otherwise, if the acquired company is trending downturn, it is risky for any company to reacquire. To conclude, relative to intangible investments, due to riskiness, information asymmetry and illiquidity of business combination investments, these reasons increase investors' assessment of uncertainty, thereby raising the risk premium demanded by investors in an imperfect competition setting. All above arguments inspire us to develop the second testable hypothesis:

H_{1b} : The firm's cost of equity capital is positively associated with the amount of accounting goodwill.

This paper defines organizational capital including all intangibles (excluding R&D stock capital, goodwill amount) that confer on the firm's competitive advantages. This broader definition, when combined with R&D capital and synergies from merger and acquisition, is the knowledge used to combine human skills, physical capital and synergies into systems for managing business smoothly and effectively (Lev & Radhakrishnan, 2003). Recall that the pool of organizational capital investment is in human resource, information technology, workplace practices, and marketing. Due to the variety of the components, different types of organizational capital investment is associated with termination of the employment relationship, while the risk of information technology investment resides in the uncertainty about its economic impact, technological complexity, and implementation challenges. Another risk factor of all types of organizational capital investment is related to their irreversibility. Unlike investments in physical assets, organizational capital investment is very difficult to recover (Shangguan, 2005). Thus, it is undeniable that organizational capital investment is highly risky in the viewpoint of investors. Together with its riskiness, organizational capital investment results in the potentially high level of information asymmetry owing to

the difficulty in tracking both their costs and benefits (Shangguan, 2005). Thus, the firm's ability to disclose reliable information is hindered. There have been longstanding debates on whether or not some firm expenditures should be recognized as revenue expenditures or capital expenditures (Gu & Lev, 2001). Consistent with the high level of information asymmetry, organizational capital is expected to be less liquid. It is because organizational capital investment usually generates tacit and non-transferable knowledge which is difficult to find an appropriate market for trading.

To summarize, relative to intangible investments, organizational capital investment has high levels of riskiness, asymmetry and illiquidity. As illustrated by financial theories on the cost of equity capital, the higher riskiness, asymmetry and illiquidity are, higher the cost of equity capital is expected. However, since there are many components in the pool of organizational capital, this paper may not affirm whether this is a positive or negative association between the cost of equity capital and organizational capital investment. Hence, this paper tests the third hypothesis as follows:

 H_{1c} : There is a negative association between the firm's cost of equity capital and organizational capital investment level.

3. Research design

3.1. Data collection

Financial accounting data has been collected in financial reports. To calculate the cost of equity capital in year t, it is necessary to have the dividend per share in year t + 2. Thus, the sample period includes 2013 to 2017. The sample consists of 120 selected firms with business combination activities from 692 public companies from many different industries that are listed in Ho Chi Minh and Hanoi Stock Exchange in Vietnam. The category by industry is presented in Table 1 and 2. In short, the final sample for main study consists of a total of 600 firm-year observations. According to Hair et al. (2010)'s rule of 15 to 20 observations for each predictor variable, the size of 600 samples is thus appropriate to make regression with a balanced panel data.

3.2. Model specification

To examine the impact of distinct types of intangible investments on firms' overall costs of equity capital, this study examines the level of R&D investment (RDC), the amount of accounting goodwill (GW), the level of organizational capital investment (ORG) in association with the firm's cost of equity capital (RE). All the hypotheses H_{1a} , H_{1b} , H_{1c} are undertaken in one regression model. Table 1 describes the expected sign according to previous studies and explains the relationship between research variables.

 $\mathsf{RE}_{i,t} = \beta_0 + \beta_1 \mathsf{RDC}_{i,t} + \beta_2 \mathsf{GW}_{i,t} + \beta_3 \mathsf{ORG}_{i,t} + \beta_4 \mathsf{ROA}_{i,t} + \beta_5 \mathsf{PB}_{i,t} + \beta_6 \mathsf{SIZE}_{i,t} + \beta_7 \mathsf{LEV}_{i,t} + \beta_8 \mathsf{BETA}_{i,t} + \epsilon_{i,t}$

Where:

 $RE_{i,t}$ = the firm's cost of equity capital

 $RDC_{i,t}$ = the level of research and development investment

GW_{i,t} = the amount of accounting goodwill

 $ORG_{i,t}$ = the level of organizational capital investment

 $ROA_{i,t}$ = return on assets in the same period

Table	Table 1. Summary of the correlations discovered in the prior studies										
		Regre	ssion variat	ble: RE							
	Affirmed sign	Proposed by	Expected sign	Explain the correlations with the dependent variable							
RDC	+	Hall et al. (1984); Lach and Schankerman (1989); Barth and Kasznik (1999)	+	R&D investment raises the firm's overall cost of equity capital since it is riskier and less liquid, and has a higher level of information asymmetry (Barth & Kasznik, 1999).							
GW	+	Shirabe (2015); Shangguan (2005)	+	The shareholders could view accounting goodwill as another risk factor (Shirabe, 2015).							
ORG	+/	Shangguan (2005)	?	Organizational capital investment possessing the characteristics of riskiness, information asymmetry and illiquidity raises a premium on investors' rate of return due to these disadvantages (Shangguan, 2005).							
ROA	_	Barth et al. (1999)	_	The high and stable return on assets limits the cost of equity capital because investors require a lower rate of return for a less risky and effective business (Barth et al., 1999).							
PB	_	Fama and French (1992); Norman (2017)	_	The fall in PB ratio leads to a rise in cost of equity capital as concerns about the health of a firm intensified (Norman, 2017).							
SIZE	_	Alberts and Archer (1973)	_	The shareholders require higher cost of equity capital due to their anxiety about higher risk of insolvency or bankruptcy in small size companies (Alberts & Archer, 1973).							
LEV	+	Pettengill and Lander (2015)	+	The equity investors expect a higher cost of equity capital because the higher level of financial leverage, the more risk they bear (Zeitun & Tian, 2007).							
BETA	+	Sharpe (1964); Treynor (1965); Lintner (1965)	+	Beta is the expected relationship between returns on a share and returns on the market in the conventional capital asset pricing model (Sharpe, 1964).							

Source: The authors' statistics

PB_{i,t} = market to book equity value

 $SIZE_{i,t}$ = logarithm of total market value of common equity at the end of the year

 $\text{LEV}_{i,t}$ = total long-term liabilities divided by total assets at the end of the same period

BETA_{i,t} = market beta estimated from the market model using monthly stock returns

3.3. Variables measurement

3.3.1. Operationalization of the variable: firm's cost of equity capital

The Ohlson and Juettner-Nauroth (2005) model is used to measure a firm's cost of equity. The reason is that this model requires fewer accounting input variables compared to other equity valuation models. The recent research by Gode and Mohanram (2003) indicates that the Ohlson and Juettner-Nauroth (2005) model provide a better estimate of the cost of equity capital. The OJ model associates with price to one-year-ahead earnings and earnings growth:

$$p_{t} = \frac{EPS_{t+1}}{RE} + \frac{Z_{t+1}}{(1+RE) - \gamma}$$
(3.1)

Where:

 $Z_{t+1} = (1/RE) [EPS_{t+2} + RE \ x \ DPS_{t+1} - (1 + RE) \ x \ EPS_{t+1}]$

 P_t = current share price in the year t

- EPS_{t+1} = expected earnings per share in the period t + 1
- EPS_{t+2} = expected earnings per share in the period t + 2

 DPS_{t+1} = dividend per share in the period t + 1

RE = firm's cost of equity capital

 γ = the yield on five-year government bonds (using the yield of 5% annually)

Rearranging the formula 3.1, the cost of equity capital on the OJ model is as follows:

$$\begin{split} \text{RE} &= \text{A} + \sqrt{\text{A}^2 + \frac{\text{EPS}_{t+1}}{P_t} [g_{t+2} - (\gamma - 1)]} \\ \text{Where: A} &= \frac{1}{2} \left(\gamma - 1 + \frac{\text{DPS}_{t+1}}{P_t} \right) \text{ and } g_{t+2} = \frac{\text{EPS}_{t+2} - \text{EPS}_{t+1}}{\text{EPS}_{t+1}} \end{split}$$

To make model applications simple, it is assumed that there is the similarity in the perpetual earnings growth rate (γ) for each company in every year. Despite the problematic issue of this assumption, the interpretation of the empirical results is not substantially affected because "measurement errors in estimating costs of equity capital appear in the error term of the regression" (Chan et al., 2009).

3.4. Operationalization of the variable: the level of R&D investment

According to Vietnamese accounting standards, the firms are not currently required to disclose the information on R&D investment level compulsorily, as a result, it is difficult to collect this information in the financial statements. Therefore, this paper uses cash outflow from purchasing tangible and intangible assets excluding the purchase of controlled entities and businesses. This spending is used as an indirect measure of a firm's R&D investment during a year in case of unavailable financial information on R&D (Lev & Sougiannis, 1996). This paper measures cumulative R&D investment by lump sum value of the carrying amount of the prior years' R&D investments. Therefore, an amortization rate is needed to measure cumulative R&D investment over multiple years. Following Lev and Sougiannis (1996), Gu and Lev (2001), and Shangguan (2005), this paper accepts that R&D investment roughly is straightly depreciated within a 3-year economic life. The authors are unable to apply a long duration of the depreciation in case the authors may not collect enough data in a young Vietnam stock exchange market where information has been fully available since 2010. On the basis of 3-year economic life, the cumulative R&D investment (RDC) in the year t is:

$$RDC_{i,t} = RD_{i,t} + 2/3 RD_{i,t-1} + 1/3 RD_{i,t-2}$$
 (3.2)

Table 2. Summary of	the contribution rate of s	elling, general admin	istration spending by i	ndustry		
		Number of	Number of			
Order	Industry	companies	observations	۲з	Υ4	۲s
1	Commercials	14	70	1.873	-1.744	0.222
2	Information technology	5	25	19.258	-15.509	-4.577
£	Professional services and scientific instrument	6	45	2.545	-2.490	-0.746
4	Energy and mining	7	35	3.879	-0.081	3.043
5	Industrial manufacturing	26	130	-23.510	24.016	1.672
6	Agriculture	5	25	-9.346	0.068	8.487
7	Finance and insurance	3	15	-0.331	0.474	0.039
ω	Transportation and logistics	8	40	-5.165	4.334	-1.382
Q	Construction and Real estate	43	215	0.038	-0.033	0.143
Source: The authors' regres	ision by Eviews 9.0					

9.0
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Where:

RDC_{i,t} = cumulative level of R&D investment in the year t RD_{i,t} = level of R&D investment in the year t

 $RD_{i,t-1}$ = level of R&D investment in the year t—1

 $RD_{i,t-2}$ = level of R&D investment in the year t-2

3.5. Operationalization of the variable: the amount of accounting goodwill

GW_{i,t} is the accounting goodwill amount in the current year. This paper focuses on accounting goodwill acquired from the business combination. Under Vietnamese generally accepted accounting principles, there has been an official 202/2014 circular issued by Ministry of Finance, in terms of business combination, that requires the recognition of goodwill on the statement of financial position. Therefore, the information on accounting goodwill may be easily obtained from the firms which own merger and acquisition activities. Along with the growth of merger and acquisition activities in Vietnam, the amounts of accounting goodwill recorded on the balance sheets of Vietnamese firms have increased drastically since 2010. This is the reason why the year of 2010 is chosen as the beginning period of this data.

3.6. Operationalization of the variable: the level of organizational capital investment

Unlike accounting goodwill investment, firms rarely disclose expenditures on organizational capital investment on the financial statements. The measure of organizational capital investment involves the capitalization of selling, general administrative spending (SGA), which is similar to the capitalization of research and development spending in Lev and Sougiannis (1996). Although SGA spending is immediately expensed under Vietnamese accounting standard, it incorporates the spending on most organizational capital investments such as those in human resource, IT, workplace practices, and marketing. Thus, the notion underlying the capitalization of R&D spending also applies to SGA spending. Additional arguments and evidence that SGA spending is a capital investment property are provided by Amir and Lev (1996), Lev (2001), and Lev and Radhakrishnan (2003). Firstly, this paper conducts the following firm-level estimation by industry:

$$\begin{split} Log(E_{i,t}) &= \gamma_0 + \gamma_1 Log(PPE_{i,t-1}) + \gamma_2 Log(RDC_{i,t-1}) + \gamma_3 SGA_{i,t} + \gamma_4 SGA_{i,t-1} + \gamma_5 SGA_{i,t-2} \\ &+ \epsilon_{i,t} \end{split} \tag{3.3}$$

Where:

 $Log(E_{i,t}) = logarithm of annual earnings before depreciation, R&D, and SGA expenses in year t$

 $Log(PPE_{i,t-1}) = logarithm of book value of plant, property, and equipment in year t-1, representing the firm's physical capital$

 $Log(RDC_{i,t-1}) = logarithm of accumulative level of R&D investment in the year t-1, RDC is estimated in the model 3.2$

SGA_{i,t} = selling, general administrative spending divided by net revenue in the year t

SGA_{i,t-1} = selling, general administrative spending divided by net revenue in the year t-1

SGA_{i,t-2} = selling, general administrative spending divided by net revenue in the year t-2

The rationale underlying equation (3.3) is, because SGA expenditures incorporate most organizational capital investments, they should generate future earnings for the firm. In other words, past SGA expenditures should affect current earnings. The amount of effect depends on the rates of organizational capital investments that are represented by γ_3 , γ_4 , γ_5 in the equation 3.3. As can be seen in the equation 3.3, this paper uses a maximum of 3 years of past SGA expenditures to influence current earnings so that the duration of R&D and SGA contributions on earnings are the same.

On the other hand, as shown in the literature review, the empirical results from the simple correlations and multivariate regressions do not control for the potential endogeneity of SGA_{i,t} and Ei,t (Shangguan, 2005). To control for potential simultaneity bias, instrumental variables are identified as the exogenous component of SGA expenditures variable in 2-step regression approach. SGA expenditures might be joint endogenous variables driven by some underlying exogenous variables such as total assets, profitability. A firm's SGA expenditure is expected to be consistent with its corresponding firm expenditure level, total assets (a proxy for firm size, TA_{i,t-1}), and profitability in the previous year (ROA_{i,t-1}). As procedures in the 2-step regression approach, in the first stage, SGA_{i,t} is regressed against profitability and firm size to have estimates applied in the general model of the relationship between SGA_{i,t} and log(E_{i,t}). This study adopts the following model in the first stage:

$$SGA_{i,t} = \omega_0 + \omega_1 TA_{i,t-1} + \omega_2 ROA_{i,t-1} + \epsilon_{i,t}$$
(3.4)

Where:

SGA_{i,t} = selling, general administrative spending divided by net revenue in the year t

 $TA_{i,t-1}$ = the natural logarithm of total assets in the year t-1

 $ROA_{i,t-1}$ = profitability is the ratio of net profit to total assets in the year t-1

After conducting the 2-step regression with equations 3.4 and 3.3, the value of γ_3 , γ_4 , γ_5 in the equation 3.3 are estimated by industry, as follows:

After determining the value of γ_3 , γ_4 , γ_5 in equation 3.3 by 9 industries, the firm-specific level of organizational capital investment is measured by equation 3.5.

$$ORG_{i,t} = \gamma_3 SGA_{i,t} + \gamma_4 SGA_{i,t-1} + \gamma_5 SGA_{i,t-2}$$
(3.5)

For instance, suppose if the first firm in the Commercial industry spends $SGA_{1,2013} = 0.063$, $SGA_{1, 2012} = 0.057$, $SGA_{1, 2011} = 0.059$, the cumulative organizational capital investment in year t is: $ORG_{1, 2013} = 1.873 \times 0.063 + (-1.744) \times 0.057 + 0.222 \times 0.059 = 0.032$.

4. Data analysis and findings

4.1. Descriptive statistics

Table 2 and 3 shows the descriptive statistics and correlation coefficients of all variables. Skewness and Kurtosis statistics all suggest that the variables are not normally distributed. To reduce the heteroskedasticity problem arising out of the non-normal distributions, regressions are estimated with White (1980) heteroskedasticity consistent standard errors and t-statistics by applying the function of cross-section weight in Eviews 9.0.

Table 2 also shows the correlation coefficient among RE, RDC, GW, PB, SIZE, LEV, BETA. Correlation coefficients between RE and RDC, between RE and GW, between RE and control variables are also existent and significant. However, the negative correlation coefficient between

Table 3. Descriptive statistics, correlation coefficients and multicollinearity problem										
	RE	RDC	GW	ORG	ROA	PB	SIZE	LEV	BETA	
RE	1									
RDC	0.003**	1								
GW	-0.001**	-0.060	1							
ORG	-0.050	-0.169***	-0.0315	1						
ROA	0.005*	0.123**	-0.071*	0.005	1					
PB	-0.141***	0.199***	-0.044	0.117**	0.371***	1				
SIZE	-0.196***	0.627***	-0.018	0.082**	0.266***	0.292***	1			
LEV	0.122**	0.141***	-0.135***	-0.076*	-0.433***	-0.093**	-0.185***	1		
BETA	-0.109**	0.151***	-0.055	0.055	-0.140***	-0.196***	0.147***	0.043	1	
Mean	0.196	4.743	0.016	0.082	0.047	1.114	5.376	0.532	0.919	
Median	0.188	4.738	0.003	0.014	0.035	0.720	5.303	0.577	0.915	
Maximum	0.356	7.273	0.370	3.100	0.335	9.380	8.073	0.852	5.050	
Minimum	0.081	0.602	-0.000	-1.418	-0.289	0.000	2.511	0.007	-1.634	
Std. Dev.	0.066	0.973	0.033	0.396	0.068	1.282	0.809	0.224	0.651	
Skewness	0.303	-0.198	4.910	2.497	-0.066	3.077	0.431	-0.163	0.365	
Kurtosis	2.016	3.715	37.733	17.517	6.838	15.001	3.807	2.557	7.324	
VIF	1.12	1.09	1.05	1.12	1.50	1.35	1.23	1.46	1.15	
Note: Significant at: *10, **5 and ***1 percent levels										

Source: Calculated by the authors in Eviews 9.0

RE and ORG exists but insignificantly. Of particular note is that the correlation coefficients are not of high magnitude between any two of the independent variables to cause concern about multicollinearity problems. Once again, the absence of multicollinearity problem is affirmed because of VIF being less than 2.

4.2. Selection of an appropriate regression approach

The theoretical model is examined with three regression approaches: Pooled OLS, FEM (fixed effects model) and REM (random effects model) according to GLS method for panel data processing models to reduce the issue of heteroskedasticity (Table 4). Although the results from the pooled OLS indicate that a few explanatory variables are statistically significant, it also reveals an existence of auto-correlation. Furthermore, the result of the Likelihood test rejects H0, implying that the FEM model is more suitable than the pooled OLS. After rejecting the pooled OLS model, to choose which of the two models that fixed or random effects model is more precise, the Hausman test is employed. The Hausman statistic tests null hypothesis that random effects model is appropriated for the particular sample compared to the fixed effects model. As shown in the Table 4, the significance level (p-value) of cross-section random is less than 5 per cents. Therefore, null hypothesis is unacceptable. In addition, Durbin Watson ratios in the FEM within the range of [1.5; 2.5] reveal an acceptable fit to time-series data without the presence of autocorrelation. All conclude that fixed effects model (fixed for cross-section and none for period) is better to conduct all estimations with firm-specific effects.

4.3. Empirical results

Results are reported in Table 4. In terms of fixed effects model with firm-specific effects, the coefficient of R&D investment is significantly negative ($\beta_1 = 0.001$) and validated in statistics (H_{1a}). This is in complete agreement with the outcomes of previous studies that R&D investment raises the firm's overall cost of equity capital since it is riskier and less liquid and has a higher level of information asymmetry. This result is thus consistent with the conventional finance theories ((Barth & Kasznik, 1999).

Table 4. Association between the cost of equity capital and types of intangible investments										
	Pooled	OLS		Fixed e	Random effects					
	Cross- section Period		Cross- section Period		Cross section Period		Cross section Period			
Variables	None None		Fixed	None	Fixed	Fixed	Random	None		
RDC	0.002***		0.016**		0.011		0.014***			
GW	-0.001		0.026**		0.141		0.049			
ORG	-0.125		-0.002		-0.001		-0.001	-0.001		
ROA	0.069		-0.024		-0.036		0.007			
PB	-0.010***		-0.019**		-0.015		-0.012***			
SIZE	-0.036***		-0.064***		-0.075***		-0.035***			
LEV	0.019		0.056**		-0.069*		0.007			
BETA	-0.007		-0.005		-0.007		-0.005			
CONSTANT	0.028***		0.498***		0.578***		0.303***			
Adjusted R^2	22.18		61.87		29.06		8.43			
Durbin Watson	1.400		2.130		1.897		1.487			
Likelihood test			6.062***		2.351***					
Hausman test							22.510**			
Note: Significant at: *10, **5 and ***1 percent levels										

Coloriante di fuerte a sutte ancie Estimue 0.0

Source: Calculated by the authors in Eviews 9.0

The positive correlation between accounting goodwill and cost of equity capital is noteworthy at 5% validation in statistics (H_{1b}). It means the larger the amounts of goodwill, the higher the cost of equity capital factor, the results consistent with prior study (Shirabe, 2015). Firstly, this paper has implication for equity investment decision. This result implies that shareholders could view accounting goodwill as another risk factor. Therefore, it is required to take into account for goodwill when the management estimate the firm's cost of capital for business valuation. Secondly, the management should analyse the shareholders' behaviour before making decision on a merger and acquisition deal. Goodwill reflects the future excess profit from business combination, mainly based on the unobservable information, as a result, the equity investors require a higher rate of return because they feel that they are bearing higher risk for any incremental merger and acquisition project.

Regarding the influence of organizational capital investment H_{1c} , it is discovered a negative relationship with the cost of equity capital. There is a potential explanation for this result. Although organizational capital investment is also less liquid and has a higher level of information asymmetry, it may help reduce the overall risk of a firm because the investors believe that more investments in a firm's infrastructure can enhance the quality of management to bring higher return. However, this result was not validated in statistics ($\beta = -.0019$; $\rho = .723 > .05$). The statistical validity is not achieved because, except for R&D investment and business combination investment, organizational capital investment is a pool of the other intangible investments, which each of them has the distinguished trend with the cost of equity capital.

Amongst control variables, regression results with SIZE, LEV control variables are statistically consistent with the prior research, except for the variables of ROA, BETA. Simply, the regression with LEV draws the conclusion that the investors require a higher cost of equity capital as a consequence of evaluating that firms with higher level of financial leverage are riskier than

firms with more shareholders' capital ($\beta_7 = 0.056$, sig. = 0.0096). The firm size (SIZE) has negative ($\beta_6 = -0.064$) and significant impact on the cost of equity capital. In Vietnamese market, the shareholders must bear more transaction costs and agency costs in most of the small companies which are assessed to be higher risk of insolvency or bankruptcy. Consequently, the higher agency cost shareholders pay, the higher return they require. This matches some previous research being undertaken in the developing countries, for example, the studies of Alberts and Archer (1973); Jiraporn and Liu (2008).

As put forward by Fama and French (1992), the evidence this study found points to a negative relationship between price-to-book value (PB) and the cost of equity capital (RE). The negative relationship ($\beta_5 = -0.019$, sig. = 0.0056) means that corporations that the financial market judges to have poor predictions, indicated here by low stock price and low PB ratio, have higher expected stock return (they are penalized with higher cost of equity capital) than firms with strong prospects.

5. Conclusions and implications

Corporate intangible investments have grown significantly in Vietnam over the last decade. While it is well recognized that these types of investments are essential for firms' competitive advantages and long-term profitability, relatively little is known about (1) the cost of equity capital for financing these investments, and (2) the impact of existing intangible investments on firm's overall costs of equity capital. Without knowing these, our understanding of how intangible investments create values for shareholders is limited. As a general discussion, this study's overall objective has been encountered owing to its validation of the correlation between a firm's cost of equity capital and intangible investments detailed in R&D investment, goodwill and organizational capital investment. This study adds to the existing business valuation literature by providing additional evidence of the impact of R&D investment and goodwill on accounting for equity capital valuation. Our study explores that R&D investment as well as merger and acquisition investment are risk factors resulting in higher cost of equity capital because they are riskier and less liquid and has a higher level of information asymmetry under shareholders' viewpoints. In practice, merger and acquisition activities in the Vietnamese market happen continuously; at the same time, intangible assets account for a significant proportion of the total assets. In addition, Vietnamese accounting standards are not yet developed enough to accurately assess the value of intangible assets and their impairment loss issues. Thus, tangible fixed assets become risky from managers' point of view. Future studies can compare more different perspectives of the proxy variable to increase the robustness of the research model.

Given the widespread concern over intangible investments recently, it is important for managers and shareholders, who are intended to make their own financial decisions based on assets investment portfolio and equity investment portfolio, respectively. Firstly, according to Shirabe (2015)'s study, managerial efficiency weaken the positive relation between intangible investments and cost of capital. Managers should choose the optimal proportion between tangible investments and intangible investments in each phase of a firm's business cycle. They decide when in business cycle should be invested more research and development expenditure as well as business combination investment to achieve sustainable competitive advantages at the low cost of equity capital. For example, in the phase of business growth or firm maturity, although managers choose to spend more intangible investments rather than tangible investments, it is possible not to increase shareholders' rate of return because shareholders believe that these investments are less risky in the context of business growth with strong prospect. An organization can apply the same methodology as demonstrated in this work to find out its own interactions between its intangible indicators and financial performance indicators such as cost of capital, return on equity, etc. Thereby, the manager sets up a foundation for future advancements in intangible consumptions and ensures intangibles more perceptible in a firm's asset portfolio.

Secondly, the finding of this study equips a better understanding of investors' behavior that could be attention of executives and governors. Based on the extent to which investment in intangibles is undertaken, investors may assess how risky and liquid this intangible investment is, in the light of the trend of the expected cost of equity capital. The investors frequently assess intangible investments as risk factors to decide a higher rate of return due to the issue of information asymmetry. Therefore, Vietnamese public companies should think how to report intangibles in their financial statements. However, there is an alarming demand for a common designation, transparency in data bases and consistency in data handling. An obvious definition of intangibles and advancement of new instruments to value the intangibles, and a better insight of consequences of intangibles on an organization's business strategy are needed if intangibles are reported to externals.

Several shortcomings in this study should be drawn to be acknowledged. The first limitation is that the sample applied to investigate the correlation amongst cost of equity capital and intangible investments is restricted to publicly listed enterprises. It is too difficult to collect annual reports of corporates that are not published in Vietnamese stock exchange market, hence are prohibited from this study. Secondly, the dataset extracted from a single East Asian nation, not cross-nation investigation could be noisy and require prudence in terms of generalizing the findings. Thirdly, the measurement issue is critical in this study. Lev and Sougiannis (1996)'s method was adopted to measure organizational capital investment by capitalizing the selling, general administrative expenses. Although the authors believe this measure reasonably approximate firms' intangible investments, they are undoubtedly subject to errors due to various econometric problems that can be minimized but not resolved.

Further research is required on the other components of intangible capital such as human, information technology, marketing investments excluded in this study but caused in the research of investors' behavior in the capital market. It would be to examine by qualitative approach to what extent should be focused to develop the control of the effectiveness of intangible investment in association with decreasing cost of equity capital.

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