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The Relationship between Diversification Strategy and Cost of Capital — Evidence from Taiwan

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Abstract: The main purpose of this study is to explore the relationship between diversification strategy and the cost of capital, and provide Taiwanese companies with advices while doing the diversification decision making. We obtain data from Taiwan Economic Journal (TEJ) database during the period of 2004 to 2013. The total sample is 4,048 firm-year observations. We employ multivariate regression analysis to analyze the degree of diversification strategy's impact on cost of equity capital, cost of debt capital, and the weighted average cost of capital. The results show that the degree of diversification cannot affect corporate cost of capital, implying that stakeholders are not convinced by the risk reduction through firms' diversification strategies.

Key words: Diversification; Cost of Equity Capital; Cost of Debt Capital; Weighted Average Cost of Capital

1. Introduction

The appearance of diversification strategy was originated in the 1960s when the economy boomed, the stock market rose and many companies had lots of money in hand in prosperous USA, due to the stimulus of the Vietnam War. Therefore, diversification was very popular in many companies, causing companies to enter other industries.

Corporate diversification and its impact on firm value have long been interesting research topics. Many scholars research the issue that diversification will create or destroy firms' value. The traditional view of scholars believe diversification strategy would reduce company's performance (Lang and Stulz, 1994; Berger and Ofek, 1995; Lamont and Polk, 2002). Diversification strategy bring about capital misallocation is the reason, no matter it origins from inefficiency allocation of company internally generated fund, or manager's problems of resource misallocation due to self-interest. However, the other school of scholars believe that firms which implement diversification strategy have better performance than those do not (Carter, 1977; Nguyen *et al.*, 1990).

Because diversification strategy can arouse synergy effects, economies of scale, generate tax benefits, increase debt capacity, and make internal capital market efficient. As we can see, scholars find quite inconsistent views about the relationship between diversification strategy and firm performance.

In addition, most of the research (Mansi and Reeb, 2002; Villalonga, 2004) is to use excess value and excess firm value which is proposed by Berger and Ofek (1995) to examine diversification strategy's influence. There are also other studies using different types of indicators to measure company's performance, such as, market power (Montgomery, 1985), Tobin's q ratios (Lang and Stulz, 1994), stock returns (Comment and Jarrell, 1995), and ROE ratio (Carter, 1977). In spite of the fact that many researchers have explored the relationship between diversification strategy and firm value, few of them discuss from the aspect of cost of capital. In this research we will fill this gap.

We want to research diversification strategy's impact on firm's value from the aspect of cost of capital, that is, to discover whether diversification can reduce corporate cost of capital. Because cost of capital is very crucial for enterprises to measure company's performance. The importance is as follows: Above all, cost of capital can be used to measure firm's riskiness. Second, cost of capital also presents investors' required rate of return on corporate investments. If a company can finance at a lower cost of capital, representing the company is exposed to a lower risk, investors would be confident for the company's future development and performance. Hence, the aim of this paper is to investigate the impacts causing from diversification strategy on firm's cost of capital, and examine if firm's value will be affected.

In this study, we use multivariate regression analysis to analyze the degree of diversification strategy's impact on the cost of equity capital, cost of debt capital, and the weighted average cost of capital. Entropy measure is the proxy to measure degree of diversification. Some robustness checks are also applied. Our empirical results show that the degree of diversification cannot affect corporate cost of capital. There is no significant relationship between diversification and corporate cost of capital. This means that firm with diversification does not reduce firm's risk, make investors require lower required rate of return, reduce corporate cost of capital. We hope our finding can provide companies with advices when doing the decision making about diversification strategy.

The reminder of the paper is organized as follows. Chapter 2 reviews the related literature. Topics include diversification motivations, and firm performance with diversification. Chapter 3 presents the data selection and methodology which are used in this paper. Chapter 4 exhibits and explains the empirical results. Finally, Chapter 5 provides a summary and conclusions of the paper.

2. Literature Review

2.1. Diversification Motivations

Diversification strategy has become a very important part of company's strategy management in recent years. Over the last decades, numerous theories on diversification motives have been developed. In this paper, we will follow Montgomery (1994) methods to distinguish diversification motivations into three theoretical perspectives. Montgomery (1994) points that a company implementing diversification strategy would bring about increasing market power, and get the benefit of resource allocation efficiency. In addition, he also considers manager's self-interest factor as one of diversification motivations. Therefore, we can sum up diversification motivations as three motives: market power persepectives, resourse based views, and agency theory.

Market Power Perspectives

Market power means that market participants have the ability to influence the market price, quality and the nature of the product in the marketplaces, Hill (1985) proposes that diversified firms have lower expenses expenditures with respect to the undiversified firms, because diversified firms have strong abilities in industries. In addition, in Hill's research sample, most of diversified companies obtain a market leader advantage.

Apart from this, Montgomery (1994) offers three anti-competitive motives for diversification, explaining how companies acquire market power by diversification strategies. The first one is that firms can take advantage of profits generating by one sector to subsidize losses caused by the other sector which adopts predatory pricing. That is, cross-substitution. The second motive is that diversified firms can collude with other firms competing in multiple markets to manipulate market prices. That is mutual forbearance hypothesis of multi-market competition. And the final anti-competitive motivation is that diversified firms would implement reciprocal buying to crowd out smaller competitors.

Resources-based perspectives

When diversified companies process excess capacity of resources, they can transfer the idle capacity between different departments (Martin and Sayrak, 2003). Companies perform appropriate degree of diversification can attain the effect of economies of scope (Rumelt, 1982). For example, companies can apply the same marketing strategies, distribution channels, R&D operations, and brand names to various business activities. In the same manner, diversified companies can also share their human resources and financial resources to cope different industrial sectors to accomplish synergy effects (Das and Mohanty, 1981; Teece, 1980; Amit and Livnat, 1988; Montgomery, 1994). Matsusaka and Nanda (2002) make use of resources-based idea to construct a

dynamic model discovering diversified companies would take advantage of entering new businesses and exiting old ones repeatedly in search for good matches with their organizational capacities.

Agency Theory Perspectives

Agency theory indicates that in spite of actual investment efficiency from the shareholder viewpoint, diversification typically may be in the best interests of management (Erdorf *et al.*, 2013). Managers have three incentives to diversify their companies: The first aspect, diversification strategy is favorable for managerial reputation, compensation and power. If a company diversifies into other industries, the size becomes greater. As a result, manager's prestige, position and compensation associated with the firm size can be improved. (Jensen, 1986; Jensen and Murphy, 1990; Stulz, 1990). The second view, managers will increase the degree of diversification in order to enhance their cost of being substituted. Managers can consolidate their position of the company by making investments that require their particular skills (entrench themselves) (Shleifer and Vishny, 1989, 1990). The last argument, Amihud and Lev (1981) advocate that managerial undiversifiable employment risk (e.g. risk of losing job, professional reputation, etc.) can be cut down by reducing operating risk of diversified firms. Since this kind of human capital risk cannot be dispersed on their own. Aggarwal and Samwick (2003) build a model of two agency explanations of diversification, which is private benefits and risk reduction. Their evidence supports the concept of private benefits.

2.2. Diversification and Firm Performance

2.2.1. The Negative Relationship between Diversification and Firm Performance

In recent years, there are a lot of research papers show a negative correlation of diversification and company performance. The main reason resulting in loss of firm value is capital misallocation, no matter it origins from inefficiency allocation of company internally generated fund, or manager's problems of resource misallocation due to self-interest. The inefficiency of resource allocation will cause the problem of cross-subsidization, which is, utilizing cash flows from operating well sector to support the other sector with relatively poor cash flows.

From the view of capital misallocation hypothesis, Shin and Stulz (1998) discover that a segment's capital expenditures of a diversified firm depend significantly on the cash flows of the other segments of the firm as well as their own cash flows. As a result, the sensitivity of a segment's capital expenditures to the cash flows of the other segments within the diversified firm would not be determined by whether its investment opportunities are better than those of the firm's other segments. This may cause over investment in poor projects, or take over negative present value (NPV) investment projects.

Scharfstein (1998) also offers additional evidence that support the cross-subsidization hypothesis, because he figures out that diversified firms invest too much in poor investment opportunity (low Q) segments and too little in high investment opportunity (high Q) segments. Rajan et al. (2000) demonstrate that a higher diversity of investment opportunities across divisions bring about a higher extent of misallocating internal capital by diversified firms and a higher level of diversification discount. He then discoveries a negative effect of diversification on excess value through the value added by allocation. Maksimovic and Phillips (2002) advance that diversified firms are less productive than single-segment firms of a similar size. Berger and Ofek (1995) extend that over investment and cross-subsidization in diversified firms contribute to the loss of firm value.

From the aspect of agency theory, most agency theorists argue that professional managers with little equity capital of their own may pursue value-reducing activities such as diversification at the expense of shareholders (Jensen and Meckling, 1976). Excess cash flow can make managers to do diversify, and managers would be unwilling to distribute additional earnings as dividends, since this kind of action would lower the resources under their control. Managers will thus use the excess cash flow in value-reducing activities such as investing in poor performance projects (Jensen, 1986). Denis et al. (1997) contend that agency problems are responsible for firms maintaining value-reducing diversification strategies. As mentioned above, agency problems that managers' pursuing self-interest action conflicts with maximizing shareholder value. It generates over-diversifying and inefficiency of resource allocation, therefore, poor company performances.

There are many empirical results display a negative relationship between diversification strategies and firm performances. Montgomery (1985) adopts Fortune 500 Company as data, arguing that highly diversified firms have lower market power than less diversified firms. Lang and Stulz (1994) find that highly diversified firms have significantly lower average and median Tobin's q ratios than single-segment firms, meaning that highly diversified firms are valued less than specialized firms. Besides, Comment and Jarrell (1995) approve that the company which decreases in diversification level will have a higher stock return. Berger and Ofek (1995) confirm that diversification strategies reduce firm value, owing to over investment and cross-subsidization effect.

2.2.2. The Positive Relationship between Diversification and Firm Performance

While most of the literatures verify diversification strategies will reduce the performance of the company, there are still some articles which scholars put forward the opposite view. Diversification strategy has the following advantages that can enhance the firm value: reduce the volatility of cash flow, increase debt capacity, enhance internal capital market efficiency and generate synergy effects.

Lewellen (1971) advances the idea of coinsurance effect for corporate debt. He suggests that diversified firm's cash flow comes from less-than-perfectly correlated sectors will lower the volatility of cash flow and reduce the default risk of the corporate, thus increasing the company's debt capacity. Berger and Ofek (1995) also provide evidences that companies can get tax benefits through diversification strategies because of the increased borrowing capacity. Stein (1997) argues that diversification can lead to internal capital market efficiency through transferring funds from limited development operating to more promising divisions to create shareholder value. In the end, Rumelt (1982) argues that product diversification may attain economies of scope, thus, generate synergy effects.

Prior empirical studies show diversification is positively correlated with the company performance. Carter (1977) advances that diversified firm's ROE ratio outperform their specialized counterparts. Berry (1971) states that the relationship between corporate growth and the products diversification is high. Khanna and Palepu (2000) discover a firm value premium for diversified firms with Indian companies as data. Kuppuswamy *et al.* (2014) demonstrate that diversified firms have a higher value relative to comparable single-segment firms on account of the capital and labor market efficiency.

Considering the literatures of diversification strategy and corporate performance, the arguments put forward by scholars is inconsistent. A stream of articles indicate that corporate diversification would have negative impacts on firms' performance (Berger and Ofek, 1995; Maksimovic and Phillips, 2002; Jensen and Meckling, 1976; Jensen, 1986; Denis *et al.*, 1997). Another stream of researches believe that corporate diversification would enhance firms' performance (Khanna and Palepu, 2000; Kuppuswamy *et al.*, 2014; Berry, 1971). Although the association between diversification and firm performance has discussed for a long time, few scholars measure the impact of diversification strategy from the aspect of cost of capital. We want to complement the literature of corporate diversification's impact. Consequently, the aim of this paper is to investigate the relationship between diversification strategy and corporate cost of capital, including cost of equity, cost of debt, and the weighted cost of capital.

3. Data and Methodology

3.1. Data Selection

In this paper, we investigate listed companies which are publicly traded in the Taiwan exchange market from the period 2004 to 2013. The sample is annual firm-level data from Taiwan Economic Journal (TEJ) database, in the beginning we obtain 14,578 firm-year observations, including 1,535 Taiwanese companies.

The data is picked out based on the following criteria: first step, delete the financial, insurance and securities industries, because their features of

business including financial structure and law regulation are different from those of ordinary industries. Next, remove the observations which have missing values in the variables. Finally, in order to avoid the effects of outliers, we exclude the observations which are at the top and bottom one percent of material data. Eventually, we get 4,048 firm-year observations, including 627 Taiwanese firms.

3.2. Methodology

In order to examine the relationship between diversification strategy and the cost of capital. We analyze the relationship from three aspects, they are the cost of equity capital, the cost of debt capital, and the weighted average cost of capital in this section.

3.2.1. Cost of Equity Capital Research Design

To examine the relation between diversification strategies and the cost of equity capital, we follow previous literature and model the cost of equity capital as a function of the factors which would have impacts on cost of equity (Campbell et al., 2012; Demirkan et al., 2012; Francis et al., 2005). The cost of equity capital is measured by capital asset pricing model (Graham and Harvey, 2001; Cummins and Phillips, 2005; Black, 1972). We then extend this model to include corporate diversification index:

$$COEC_{i,t} = \alpha_0 + \beta_1 Div_{i,t} + \beta_2 Log(MVE)_{i,t} + \beta_3 Leverage_{i,t} + \beta_4 BTM_{i,t} + \beta_5 ROA_{i,t} + \beta_6 SALEGRW_{i,t} + \beta_7 Rating_{i,t} + \varepsilon \quad (1)$$

where the subscript *i* represents the firm, and *t* represents the year. The detail definitions of variables are shown in table I.

CAPM defines the cost of equity capital equates risky free rate plus expected risk premium which the company owns. The CAPM cost of equity capital is given by the following formula:

$$COEC_{i,t} = R_{ft} + Beta_{i,t} (R_{mt} - R_{ft})$$

The detail definitions of variables used in calculating $COEC_{i,t}$ are also shown in Table I. In particular, if $COEC_{i,t}$ calculated is less than R_{ft}, we replace $COEC_{i,t}$ with R_{ft} as cost of equity capital. Because the cost of equity is not reasonable to be below risky free rate.

Concerning our measurement of corporate diversification, numerous literatures have applied a number of measures of corporate diversification. In this paper, we identify the degree of diversification by entropy method (Palepu, 1985; Jacquemin and Berry, 1979). Jacquemin and Berry (1979) develop entropy measure to measure the corporate diversification. Entropy index considers two elements of diversification. First, the number of products the firm sales. Second, the relative importance of each product's sale to total net sales. And the entropy measure of diversification is defined as follows:

Table I: Definition of Main Variables

Variables	*Descriptions*
$COEC_{i,t}$	The cost of equity capital of firm *i* in year *t*, using CAPM model.
$CODC_{i,t}$	The cost of debt capital of firm *i* in year *t*.
$COC_{i,t}$	The cost of capital of firm *i* in year *t*, we use the weighted average cost of capital as a proxy.
$Div_{i,t}$	Corporate diversification measures of firm *i* in year *t* by entropy method
$Log(MVE)_{i,t}$	The natural log of market value of equity of firm *i* in year *t*.
$Leverage_{i,t}$	Debt ratio of firm *i* in year *t*, computed as total debt divided by total assets.
$BTM_{i,t}$	Book to market equity of firm *i* in year *t*, computed as book value of equity divided by market value of equity.
$ROA_{i,t}$	The return on assets of firm *i* in year *t*, measured as net income divided by total asset.
$SALEGRW_{i,t}$	Sales growth rate of firm *i* in year *t*, measured as sales $_{t}$ minus sales $_{t-1}$ divided by sales $_{t-1.}$
$Rating_{i,t}$	Taiwan Corporate Credit Risk Index (TCRI) of firm *i* in year *t*, where one is assigned to firms with the highest rating and nine is assigned to firms with a lowest rating (as reported in the TEJ database).
$Beta_{i,t}$	Beta coefficient of firm *i* in year *t*. We use CAPM one year beta obtained from TEJ database.
$R_{f\,t}$	The risky free rate in year *t*, measured as Taiwan Bank annual fixed deposit average rate.
$DTE_{i,t}$	Debt to equity ratio of firm *i* in year *t*, measured as total debt divided by the market value of equity.
$R_{m\,t}$	The expected return on the market portfolio in year *t*. We employ annual average return of Weighted Price Index of Taiwan Stock Exchange as a proxy.
$P_{j\,i,t}$	Sales proportion of *j* th product to firm *i*'s total sales in year *t*.
n	The number of products which the firm sales, the product category is based on TEJ database.

$$Div_{i,t} = \sum_{j=1}^{n} P_{ji,t} \times \ln\left(\frac{1}{P_{j\,i,t}}\right)$$

The detail definitions of variables used in calculating $Div_{i,t}$ are shown in Table I. If the firm's $Div_{i,t}$ is equal to zero, it means that the firm is perfect specialized. On the other hand, a larger value of $Div_{i,t}$ means that the firm has a higher degree of overall diversification.

Additionally, our cost of equity model incorporates control variables that are similar with prior research. We expect $Log(MVE)_{i,t}$ to be inversely related to $COEC_{i,t}$ because large firms are expected to attract more attention that can reduce asymmetric information and lowers the firm's cost of equity capital (Bowen et al., 2008). The scholar finds that company which has higher $Leverage_{i,t}$, its default risk is higher, so the financing cost is relatively high (Francis et al., 2005). Book to market equity ($BTM_{i,t}$) controls for growth opportunities. Prior

research has found positively evidence on the relation between book to market equity and ex post mean stock return (Fama and French, 1992). The academic proves that the higher return on asset, the lower the default risk, thus, the investor will ask lower cost of equity (Francis *et al.*, 2005). Previous studies show the company's growth rate ($SALEGRW_{i,t}$) have a positively relationship of cost of equity capital, so this study include this control variable (Ashbaugh-Skaife et al., 2007). Finally, our model incorporates credit rating ($Rating_{i,t}$), since prior research documents a strong positive association between credit rating and the cost of equity (Avramov *et al.*, 2009).

3.2.2. Cost of Debt Capital Research Design

To examine the association between diversification strategy and the cost of debt, we follow prior literatures and contain some characteristics that are proven to be the influences of cost of debt as control variables. (Campbell *et al.*, 2012; Dhaliwal, 2008; Kabir *et al.*, 2013) We then extend this model to include cost of debt and corporate diversification index ($Div_{i,t}$):

$$CODC_{i,t} = \alpha_0 + \beta_1 Div_{i,t} + \beta_2 Log(MVE)_{i,t} + \beta_3 Leverage_{i,t} + \beta_4 BTM_{i,t} + \beta_5 ROA_{i,t} + \beta_6 Rating_{i,t} + \beta_7 Beta_{i,t} + \beta_8 R_{ft} + \varepsilon \quad (2)$$

where the subscript *i* represents the firm, and *t* represents the year. The detail definitions of variables are shown in table I.

Consistent with prior studies, we measure cost of debt as the interest rate on firm's debt, which is calculated as interest expense and capitalization of interests for the year divided by average short and long term debt during the year (Francis *et al.*, 2005). The cost of debt capital is given by the following formula:

$$CODC_{i,t} = \frac{Interest\ Expense + Capitalization\ of\ Interests\ of\ Firm\ i\ in\ Year\ t}{Average\ Short\ Term\ and\ Long\ Term\ Debt\ of\ Firm\ i\ in\ Year\ t} \times 100\%$$

In particular, if $CODC_{i,t}$ calculated is less than R_{ft}, we replace $CODC_{i,t}$ with R_{ft} as cost of debt capital. Because the cost of debt is not reasonable to be below risky free rate, too.

Additionally, our cost of debt model incorporates the control variables that are consistent with prior research. We expect $Log(MVE)_{i,t}$ to be negatively related to the cost of debt capital because large firms are expected to have lower default risk (Pittman and Fortin, 2004). We expect the coefficient on $Leverage_{i,t}$ to be positive if leverage increases the expected default costs. Besides, we include $BTM_{i,t}$ to control for growth opportunities. If firms with more growth opportunities have a lower cost of debt, then $BTM_{i,t}$ should be positively related to the cost of debt (Dhaliwal, 2008). The coefficient on $ROA_{i,t}$ is anticipated to be negative if more profitable firms have lower default risk and benefit from a lower cost of borrowing (Campbell *et al.*, 2012). We also include

$Rating_{i,t}$ as a concern, since prior research documents a strong positive association between credit rating and the cost of debt. We include $Beta_{i,t}$ as a proxy for the risk of the firm, and predict that it should be positively related to the cost of debt. Finally, we include country-specific variables R_{ft} to control for macro-economic conditions (Campbell *et al.*, 2012).

3.2.3. Cost of Capital Research Design

To examine the relation between diversification strategy and the cost of capital, we model the cost of capital as a function of the control variables identified for cost of equity (Model 1) and cost of debt (Model 2) and add a control for each firm's debt to equity ratio. We then extend this model to include cost of capital and entropy diversification index ($Div_{i,t}$):

$$COC_{i,t} = \alpha_0 + \beta_1 Div_{i,t} + \beta_2 Log(MVE)_{i,t} + \beta_3 Leverage_{i,t} + \beta_4 BTM_{i,t} + \beta_5 ROA_{i,t} + \beta_6 SALEGRW_{i,t} + \beta_7 Rating_{i,t} + \beta_8 Beta_{i,t} + \beta_9 R_{ft} + \beta_{10} DTE_{i,t} + \varepsilon \quad (3)$$

where the subscript *i* represents the firm, and *t* represents the year. The variables are defined as in Model (1) and (2), except for the cost of capital ($COC_{i,t}$) and debt to equity ratio ($DTE_{i,t}$). The detail definitions of variables are shown in table I.

$COC_{i,t}$ is defined as the weighted average of a firm's cost of equity and cost of debt. Cost of equity is measured the same as in Model (1). Similarly, cost of debt measures from Model (2). Thus, the cost of capital is given by the following formula:

$$COC_{i,t} = COEC_{i,t} \times \frac{Total\ Equity}{Total\ Assets} + CODC_{i,t} \times (1 - Coporate\ Tax\ Rate) \times \frac{Total\ Debt}{Total\ Assets}$$

Table I shows the detail definition of variables which are used in empirical analysis. We adjust the cost of debt to an after-tax measure by multiplying it by corporate tax rate, corporate tax rate is 25% in our sample period of 2004 to 2009, and 17% from 2010 to 2013 because of tax law changed in 2010. We expect the coefficient on $DTE_{i,t}$ to be negative if, on average, firms' cost of debt is cheaper than firms' cost of equity[1] (Campbell *et al.*, 2012).

Table II presents the summary descriptive statistics on main variables. There are the mean, median, standard deviation, minimum value and maximum value of key variables. We know that the mean value of $COEC_{i,t}$ is 0.106, the mean value of $CODC_{i,t}$ is 0.027, and the mean value of $COC_{i,t}$ is 0.073. Our finding is that cost of debt capital is on average less than cost of equity capital. In addition, the standard deviation of $COEC_{i,t}$ is 0.173, indicating that the cost of equity capital distribution is relatively discrete. Furthermore, the maximum value of $Div_{i,t}$ is 1.823. The minimum value of $Div_{i,t}$ is 0, which indicates that some companies in the sample are specialized in single segment. Besides, the mean value of $Div_{i,t}$ is 0.741, displaying that

Taiwanese companies are not operating as specialized in single segment firms on average.

Table II: Summary Descriptive Statistic on Main Variables

Variable	*Mean*	*Std.*	*Med.*	*Min.*	*Max.*
$COEC_{i,t}$	0.106	0.173	0.052	0.012	0.955
$CODC_{i,t}$	0.027	0.015	0.024	0.009	0.134
$COC_{i,t}$	0.073	0.110	0.040	0.012	0.795
$Div_{i,t}$	0.741	0.456	0.743	0.000	1.823
$log(MVE)_{i,t}$	21.027	0.917	20.961	18.963	24.087
$Leverage_{i,t}$	0.398	0.161	0.401	0.063	0.801
$BTM_{i,t}$	0.066	0.051	0.053	0.005	0.353
$ROA_{i,t}$	0.090	0.089	0.086	-0.208	0.362
$SALESGR_{i,t}$	0.080	0.308	0.045	-0.644	1.984
$Rating_{i,t}$	6.256	1.123	6	3	9
$Beta_{i,t}$	0.798	0.347	0.794	0.064	1.713
$R_{f,t}$	0.016	0.005	0.014	0.009	0.026
$DTE_{i,t}$	0.750	0.745	0.505	0.023	5.382
Observations	4,048				

4. Empirical Results and Discussions

In this section, we will discuss the empirical results of the relationship between diversification strategy and corporate cost of capital. As a result, we employ corporate cost of capital (cost of equity, cost of debt and weighted average cost of capital) as dependent variables, diversification measure (entropy diversification index) as independent variables. And we regress the cost of capital on diversification measure and several control variables. The goal is to analyze whether the degree of diversification strategy influences its cost of capital. There are two parts in the section. First, we analyze the regression results about the impact of diversification strategy on cost of capital. Second, we examine the robustness test based on the first part regression result.

4.1. The Impact of Diversification Strategy on Cost of Capital

We report diversification strategy on the cost of capital result in Table III and perform three models. In column 1, the dependent variable is $COEC_{i,t}$. In column 2, the dependent variable is $CODC_{i,t}$. Finally, the dependent variable is $COC_{i,t}$ in column 3. If $COEC_{i,t}$ and $CODC_{i,t}$ calculated is less than $R_{f,t}$, we replace $COEC_{i,t}$ and $CODC_{i,t}$ with $R_{f,t}$ as cost of equity and debt capital as we have mentioned before. We regress dependent variables ($COEC_{i,t}$, $CODC_{i,t}$ and $COC_{i,t}$) on independent variables ($Div_{i,t}$) and corresponding control variables respectively.

Model 1: Cost of Equity Capital

The coefficient of $Div_{i,t}$ is negative, but not significant. Our empirical result shows that there is no significant relationship between diversification strategy

($Div_{i,t}$) and cost of equity capital ($COEC_{i,t}$), which means firms with diversification does not reduce the risk of them. Consequently, people would not ask lower required rate of return, reducing the company's cost of equity capital. Our empirical result is consistent with Lang and Stulz (1994), they approve the degree of diversification is not correlative with the market valuation for investors.

Our empirical result suggests that company's development strategy should mainly focus on the pursuit of profit and growth, instead of reducing firm's risk. Because shareholders can build up a diversified portfolio to reduce non-systematic risk on their own. Just as Brealey and Myers (2000) argue, "diversification is easier and cheaper for the stockholder than for the corporation". Stockholders do not need company to diversify risk for them. Since company implements corporate diversification strategy may arise agency problem (Denis *et al.*, 1997). Agency problem imply managers do inefficient investment in the self-interest concern rather than actual efficient investment for shareholders. They are motived by the following self-interest factors to pursue diversification: (a) increase their power, compensation and reputation (Jensen, 1986; Jensen and Murphy, 1990; Stulz, 1990), (b) reduce their individual employment risk that is closely related to firm risk (Amihud and Lev, 1981), and (c) to entrench themselves (Shleifer and Vishny, 1989). Therefore, managers tend to enlarge their firms beyond the optimal size, and often over invest in unprofitable projects that the present value is negative when diversified company has excess free cash flows, which is called over investment problem (Jensen, 1986). Rather than paying out cash dividends to shareholders, it is likely to diminish shareholder value. Although different segments can smooth away loss when over investing in poor operating business through cross-subsidization, the overall company performing become terrible (Meyer et al., 1992). For control variables, the signs on statistically significant $ROA_{i,t}$ and $Rating_{i,t}$ are consistent with prior research.

Model 2: Cost of Debt Capital

The coefficient of $Div_{i,t}$ is negative, similarly, not significant, which means that there is no significant relationship between diversification strategy ($Div_{i,t}$) and cost of debt capital ($CODC_{i,t}$). This presents company adopts diversification strategy would not increase the company's debt capacity, so that the creditor would not ask lower required rate of return, and reduce corporate cost of debt capital. Our empirical result is consistent with Singh *et al.* (2003), they argue that product diversification is unrelated to debt usage. Thus, product diversification does not appear to create debt capacity, and therefore would not offset the firm value loss from diversification. We can conclude that diversification strategy should not be used as a strategy to expand a company's financing capacity. For control variables, the signs on statistically significant $Leverage_{i,t}$, $BTM_{i,t}$, $Rating_{i,t}$, $Beta_{i,t}$, $R_{f\,t}$ are consistent with prior research.

Model 3: Weighted Average Cost of Capital

The coefficient of $Div_{i,t}$ is positive, too. But not significant. Our result confirms that the relationship between the degree of diversification ($Div_{i,t}$) and the weighted average cost of capital ($COC_{i,t}$) is not significant. There is no evidence to show diversification ($Div_{i,t}$) has impact on cost of capital ($COC_{i,t}$). Since the results of diversification on cost of equity and cost of debt are not significant. Our finding indicates that diversification did not reduce firm's risk, investors would not ask lower required rate of return, so diversification cannot reduce company's cost of capital, which implys that stakeholders are not convinced by the risk reduction through firms' diversification strategies. Apart from that, we observe the coefficient on $DTE_{i,t}$ is statistically significant and the value is negative. It presents firms cost of debt is cheaper than cost of equity on average.

Table III: The Impact of Diversification Strategy on Cost of Capital
This table presents the regression results of diversification strategy on cost of capital. The regressions are estimated over the period 2004–2013. The dependent variable is $COEC_{i,t}$, $CODC_{i,t}$ and $COC_{i,t}$. If calculated $COEC_{i,t}$ and $CODC_{i,t}$ is less than $R_{f\,t}$, we replace $COEC_{i,t}$ and $CODC_{i,t}$ with R_{ft} as cost of equity and debt capital. The main independent variable is $Div_{i,t}$. The other is control variables. All variables are defined in Table I. The t-statistic values are reported in parentheses. ***, **, or * indicate that the coefficient estimate is significant at the 1%, 5%, or 10% level, respectively.

	(Model 1)	*(Model 2)*	*(Model 3)*
	$COEC_{i,t}$	$CODC_{i,t}$	$COC_{i,t}$
$Div_{i,t}$	-0.00175	0.000468	0.00474
	(-0.31)	(0.95)	(1.39)
$Log(MVE)_{i,t}$	0.04808***	0.000809**	0.0206***
	(12.47)	(2.27)	(8.3)
$Leverage_{i,t}$	-0.04129**	0.01555***	-0.04999***
	(-2.42)	(10.63)	(-3.22)
$BTM_{i,t}$	-0.55069***	0.04664***	-0.24342***
	(-7.8)	(7.65)	(-4.83)
$ROA_{i,t}$	-0.15447***	0.01373***	-0.01607
	(-3.9)	(4.21)	(-0.67)
$SALEGRW_{i,t}$	-0.09525***		-0.05155***
	(-10.34)		(-9.32)
$Rating_{i,t}$	0.02495***	0.00129***	0.01409***
	(8.03)	(4.88)	(7.56)
$Beta_{i,t}$		0.00091378	0.02945***
		(1.32)	(6.08)
$R_{f\,t}$		0.86753***	-7.00402***
		(18.7)	(-21.69)
$DTE_{i,t}$			-0.01007***
			(-2.64)
Constant	-0.98531***	-0.02297***	-0.31675***
	(-10.93)	(-2.83)	(-5.59)
Observations	4,048	4,048	4,048
R^2	0.102	0.148	0.2105

4.2. Robustness Test

In this section, we report additional empirical analysis that examine the robustness of the previous result in Section 4.1. $COEC_{i,t}$ and $CODC_{i,t}$ in Section 4.1 is substituted with risky free rate if the values we compute are below risky free rate. However, Financial Tsunami outburst in 2008 and European Debt Crisis hit in 2011, there was a strong influence in Taiwan stock market. Taiwan Weighted Stock Index return dropped dramatically, market return was -46.03% in 2008, and -21.18% in 2011. The cost of equity computed using CAPM model is all below risky free rate in 2008 and 2011, which is accounted for 20.4% in total samples. So $COEC_{i,t}$ in 2008 and 2011 is all substituted with R_{ft} in 2008 and 2011 respectively. To do the robustness test, we will handle these values in 2008 and 2011. Besides, we include year and industry fixed effect to do robustness check.

4.2.1. Adjust Risk Premium of 2008 and 2011

The $COEC_{i,t}$ computed using CAPM model is all below risky free rate in 2008 and 2011. Thus, $COEC_{i,t}$ in 2008 and 2011 is all taken place with R_{ft} in 2008 and 2011 respectively. The regression model is in distortion. So we use cost of equity in ordinary year to adjust misspecified risk premium in 2008 and 2011. The adjusting method is as follows. Take the adjusted $COEC_{i,t}$ of 2008 as an example, the adjusting procedure of $COEC_{i,t}$ of 2008 presented in Table IV Panel A. We should first calculate the median value of $COEC_{i,t}$ on 2006 and 2007 and arrange them according to TCRI credit rating, the result is shown in column 1, we employ median value instead of mean value owing to the standard deviation of $COEC_{i,t}$ on 2006 and 2007 is large. The credit rating starting from the third grade in our samples. And then we should compute the average value of risky free rate on 2006 and 2007, which is 1.73%, just as shown in column 2. The value in column 3 is median value of $COEC_{i,t}$ on 2006 and 2007 minus mean value of R_{ft} on 2006 and 2007, which is adjusted premium of 2008 according to TCRI credit rating. The value in column 4 is the risky free rate of 2008. Finally, adjusted $COEC_{i,t}$ of 2008 according to TCRI credit rating in column 5 is measured by adjusted premium plus risky free rate of 2008. Adjusting method of adjusted $COEC_{i,t}$ of 2011 is same as adjusted $COEC_{i,t}$ of 2008 we calculated, except for the fact that we take 2009, 2010 into consideration. The figures in 2011 are displayed in Table IV Panel B. Moreover, the $COC_{i,t}$ is also change into adjusted $COC_{i,t}$ due to adjusted $COEC_{i,t}$.

We can use TCRI credit rating to analyze $COEC_{i,t}$ because TCRI credit rating is different from other rating index which is only a measure of risks on bonds. TCRI credit rating is a measure of corporate risk, including accounting quality, industry prospects, and operating risk, and other non-financial information.

As a robustness test, we repeat our analysis with adjusted $COEC_{i,t}$ on 2008 and 2011 in our samples. Robustness result is shown in Table V. Our empirical result are very similar to those we report in Section 4.1. The coefficients of $Div_{i,t}$ are insignificant in the three model. There is no evidence to show diversification ($Div_{i,t}$) has impact on cost of capital ($COEC_{i,t}$, $CODC_{i,t}$ and $COC_{i,t}$).

4.2.2. Include Year Fix Effect of 2008 and 2011

In terms of the descriptions in Section 4.2, we know 2008 and 2011 are unstable years in our samples. $COEC_{i,t}$ in 2008 and 2011 are $R_{f\ t}$ in 2008 and 2011 respectively. The regression model is in distortion. To solve the problem, we include two dummy variables in our regressions to capture the year effect. X_{2008} is a dummy variable, if the sample year is 2008, X_{2008} equals 1, otherwise, 0. Similarly, X_{2011} is a dummy variable too, if the sample year is 2011, X_{2011} equals 1, otherwise, 0. We expect the two dummy variables would be highly significant. Our robustness analysis is in Table VI, the coefficients of X_{2008} and X_{2011} are consistent to our expectation, they are quite significant. Nonetheless, the outcome is remain the same, the coefficients of $Div_{i,t}$ are not significant. There is no evidence to show diversification ($Div_{i,t}$) has impact on cost of capital ($COEC_{i,t}$, $CODC_{i,t}$ and $COC_{i,t}$).

4.2.3. Exclude Sample Observations of 2008 and 2011

As another robustness, we repeat our analysis by excluding sample observations of 2008 and 2011 further. Total samples decline to 3,221 observations. Table VII displays the final regression result, suggesting that there is no significant relation between diversification strategy ($Div_{i,t}$) and cost of capital ($COEC_{i,t}$, $CODC_{i,t}$ and $COC_{i,t}$), that is, there is no evidence to show diversification ($Div_{i,t}$) has impact on cost of capital ($COEC_{i,t}$, $CODC_{i,t}$ and $COC_{i,t}$). The result remains the same.

4.2.4. Add Industry and Year Fixed Effect

In the last one robustness test, we consider both industry and year effect in our regressions. Industry classification is in accordance with TEJ industry categories. Results presented in table VIII is in line with our previous result. The relationship between diversification strategy ($Div_{i,t}$) and cost of capital ($COEC_{i,t}$, $CODC_{i,t}$ and $COC_{i,t}$) is not significant.

Briefly, the results of the robustness tests remain the same as Section 4.1. As a result, we can conclude that there is no evidence to confirming diversification strategy can reduce firm's risk, make investors ask lower required rate of return, and reduce corporate cost of capital.

Table IV: Adjusting Procedure of *COEC* of 2008 &2011

Panel A is adjusting method of $COEC_{i,t}$ of 2008. Column 1 is median value of $COEC_{i,t}$ on 2006 and 2007 and arrange them according to TCRI credit rating. Column 2 is the average value of risky free rate of 2006 and 2007. Column 3 is adjusted premium of 2008. Column 4 is the risky free rate of 2008. Finally, adjusted $COEC_{i,t}$ of 2008 in column 5 is adjusted premium plus risky free rate of 2008. And Panel B is adjusting method of $COEC_{i,t}$ of 2011.

Panel A					
TCRI Rating	*Med. of* $COEC_{i,t}$ *of 2006 & 2007*	*Mean of* $R_{f\,t}$ *of 2006 & 2007*	*Adjusted premium*	$R_{f\,t}$ *of 2008*	*Adjusted* $COEC_{i,t}$ *of 2008*
3	0.02526	0.02418	0.00109	0.01420	0.01529
4	0.06334	0.02418	0.03916	0.01420	0.05336
5	0.07078	0.02418	0.04660	0.01420	0.06080
6	0.06955	0.02418	0.04538	0.01420	0.05958
7	0.06783	0.02418	0.04365	0.01420	0.05785
8	0.05732	0.02418	0.03315	0.01420	0.04735
9	0.05716	0.02418	0.03298	0.01420	0.04718
Panel B					
TCRI Rating	*Med. of* $COEC_{i,t}$ *of 2009 & 2010*	*Mean of* $R_{f\,t}$ *of 2009 & 2010*	*Adjusted premium*	$R_{f\,t}$*of 2011*	*Adjusted* $COEC_{i,t}$ *of 2011*
3	0.10608	0.01355	0.09253	0.01355	0.10608
4	0.07419	0.01355	0.06064	0.01355	0.07419
5	0.07175	0.01355	0.05820	0.01355	0.07175
6	0.07331	0.01355	0.05976	0.01355	0.07331
7	0.06267	0.01355	0.04912	0.01355	0.06267
8	0.05485	0.01355	0.04130	0.01355	0.05485
9	0.05791	0.01355	0.04436	0.01355	0.05791

Table V: The Impact of Diversification Strategy on Adjusted Cost of Capital (Robustness)

This table presents the regression results of diversification strategy on cost of capital. The regressions are estimated over the period 2004–2013. The dependent variable is adjusted $COEC_{i,t}$, $CODC_{i,t}$ and adjusted $COC_{i,t}$. Adjusting method is according Table IV. The main independent variable is $Div_{i,t}$. The other is control variables. Variables are defined in Table I. The t-statistic values are reported in parentheses. ***, **, or * indicate that the coefficient estimate is significant at the 1%, 5%, or 10% level, respectively.

	Model 1 *Adjusted* $COEC_{i,t}$	*Model 2* $CODC_{i,t}$	*Model 3* *Adjusted* $COC_{i,t}$
$Div_{i,t}$	-0.00261	0.000468	0.0044
	(-0.47)	(0.95)	(1.34)
$Log(MVE)_{i,t}$	0.04608***	0.000809**	0.01821***
	(12.22)	(2.27)	(7.61)

contd. table V

	Model 1 *Adjusted* $COEC_{i,t}$	*Model 2* $CODC_{i,t}$	*Model 3* *Adjusted* $COC_{i,t}$
$Leverage_{i,t}$	-0.04233**	0.01555***	-0.06453***
	(-2.53)	(10.63)	(-4.32)
$BTM_{i,t}$	-0.46808***	0.04664***	-0.20889***
	(-6.78)	(7.65)	(-4.3)
$ROA_{i,t}$	-0.13753***	0.01373***	-0.000848
	(-3.55)	(4.21)	(-0.04)
$SALEGRW_{i,t}$	-0.09923***		-0.05354***
	(-11.02)		(-10.04)
$Rating_{i,t}$	0.02212***	0.00129***	0.01233***
	(7.28)	(4.88)	(6.86)
$Beta_{i,t}$		0.000914	0.03363***
		(1.32)	(7.21)
R_{ft}		0.86753***	-7.47957***
		(18.7)	(-24.03)
$DTE_{i,t}$			-0.0081**
			(-2.21)
Constant	-0.92096***	-0.02297***	-0.24403***
	(-10.44)	(-2.83)	(-4.47)
Observations	4,048	4,048	4,048
R^2	0.0968	0.148	0.2386

Table VI: The Impact of Diversification Strategy on Cost of Capital and Include Year Fix Effect of 2008 & 2011 (Robustness)

This table presents the regression results of diversification strategy on cost of capital. The regressions are estimated over the period 2004–2013. The dependent variable is $COEC_{i,t}$, $CODC_{i,t}$ and $COC_{i,t}$. The main independent variable is $Div_{i,t}$. We include two dummy variables to control the year of 2008 and 2011. X_{2008}, X_{2011} are 0, 1 dummy variables taking on the value one if the sample year is 2008 and 2011, respectively. The other is control variables. Variables are defined in Table I. The t-statistic values are reported in parentheses. ***, **, or * indicate that the coefficient estimate is significant at the 1%, 5%, or 10% level, respectively.

	(Model 1) $COEC_{i,t}$	*(Model 2)* $CODC_{i,t}$	*(Model 3)* $COC_{i,t}$
$Div_{i,t}$	-0.00351	0.000248	0.00389
	(-0.47)	(0.51)	(1.21)
$Log(MVE)_{i,t}$	0.04515***	0.00118***	0.01538***
	(11.98)	(3.34)	(6.53)
$Leverage_{i,t}$	-0.04356***	0.01527***	-0.07141***
	(-2.56)	(10.65)	(-4.87)
$BTM_{i,t}$	-0.39437***	0.03152***	-0.16802***
	(-5.89)	(5.12)	(-3.51)
$ROA_{i,t}$	-0.12606***	0.00942***	0.02112
	(-3.24)	(2.92)	(0.93)

contd. table VI

	(Model 1) $COEC_{i,t}$	*(Model 2)* $CODC_{i,t}$	*(Model 3)* $COC_{i,t}$
$SALEGRW_{i,t}$	-0.10313***		-0.05676***
	(-11.24)		(-10.89)
$Rating_{i,t}$	0.0213***	0.00165***	0.01062***
	(7.07)	(6.29)	(6)
$Beta_{i,t}$		0.000957	0.03992***
		(1.4)	(8.71)
R_{ft}		0.89657***	-8.36514***
		(19.3)	(-26.98)
$DTE_{i,t}$			-0.00171
			(-0.47)
X_{2008}	-0.07573***	0.00938***	-0.0682***
	(-7.87)	(11.09)	(-11.98)
X_{2011}	-0.11481***	-0.00303***	-0.0965***
	(-14.82)	(-4.42)	(-21.05)
Constant	-0.89064***	-0.03221***	-0.16023***
	(-10.17)	(-4)	(-2.97)
Observations	4,048	4,048	4,048
R^2	0.1554	0.1808	0.3005

Table VII: The Impact of Diversification Strategy on Cost of Capital and Exclude Observations of 2008 & 2011 (Robustness)

This table presents the regression results of diversification strategy on cost of capital. The regressions are estimated over the period 2004–2013, except for 2008 and 2011. The dependent variable is $COEC_{i,t}$, $CODC_{i,t}$ and $COC_{i,t}$. The main independent variable is $Div_{i,t}$. The other is control variables. Variables are defined in Table I. The t-statistic values are reported in parentheses. ***, **, or * indicate that the coefficient estimate is significant at the 1%, 5%, or 10% level, respectively.

	(Model 1) $COEC_{i,t}$	*(Model 2)* $CODC_{i,t}$	*(Model 3)* $COC_{i,t}$
$Div_{i,t}$	-0.00433	0.000311	0.00522
	(-0.63)	(0.57)	(1.3)
$Log(MVE)_{i,t}$	0.05349***	0.00117***	0.01749***
	(11.52)	(3.34)	(6)
$Leverage_{i,t}$	-0.04664	0.0145***	-0.07587***
	(-2.27)	(9)	(-4.17)
$BTM_{i,t}$	-0.54437***	0.03056***	-0.20188***
	(-5.81)	(4.13)	(-3.16)
$ROA_{i,t}$	-0.15912***	0.01033***	0.02747
	(-3.31)	(2.85)	(0.97)
$SALEGRW_{i,t}$	-0.12404***		-0.06981***
	(-11.4)		(-11.02)
$Rating_{i,t}$	0.02559***	0.00173***	0.01242***
	(6.81)	(5.87)	(5.69)

contd. table VII

	(Model 1) $COEC_{i,t}$	*(Model 2)* $CODC_{i,t}$	*(Model 3)* $COC_{i,t}$
$Beta_{i,t}$		0.000873	0.04793***
		(1.16)	(8.59)
R_{ft}		0.89689***	-8.19265***
		(19.17)	(-23.75)
$DTE_{i,t}$			-0.00697
			(-1.43)
Constant	-1.07752***	-0.0322***	-0.21801***
	(-9.91)	(-3.58)	(-3.27)
Observations	3221	3221	3221
R^2	0.1083	0.1647	0.2689

Table VIII: The Impact of Diversification Strategy on Cost of Capital and Add Industry & Year Fixed Effect (Robustness)

This table presents the regression results of diversification strategy on cost of capital. The regressions are estimated over the period 2004–2013. The dependent variable is $COEC_{i,t}$, $CODC_{i,t}$ and $COC_{i,t}$. The main independent variable is $Div_{i,t}$. In addition, we include both industry and year effect in the regressions. The other is control variables. Variables are defined in Table I. The t-statistic values are reported in parentheses. ***, **, or * indicate that the coefficient estimate is significant at the 1%, 5%, or 10% level, respectively.

	(Model 1) $COEC_{i,t}$	*(Model 2)* $CODC_{i,t}$	*(Model 3)* $COC_{i,t}$
$Div_{i,t}$	-0.00433	-0.0000206	-0.00157
	(-0.63)	(-0.04)	(-0.96)
$Log(MVE)_{i,t}$	0.05349***	0.00105***	0.00588***
	(11.52)	(2.93)	(4.92)
$Leverage_{i,t}$	-0.04664	0.01609***	-0.10704***
	(-2.27)	(10.91)	(-14.5)
$BTM_{i,t}$	-0.54437***	0.03358***	-0.06304***
	(-5.81)	(5.38)	(-2.61)
$ROA_{i,t}$	-0.15912***	0.00954***	-0.01492
	(-3.31)	(2.93)	(-1.31)
$SALEGRW_{i,t}$	-0.12404***		0.00312
	(-11.4)		(1.16)
$Rating_{i,t}$	0.02559***	0.00155***	0.00181**
	(6.81)	(5.84)	(2.02)
$Beta_{i,t}$		0.00156***	0.06054***
		(2.06)	(23.85)
R_{ft}		1.26543**	7.28218***
		(2.42)	(4.1)
$DTE_{i,t}$			0.00851***
			(4.7)
Industry Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
Constant	-1.07752***	-0.03761***	-0.18563***
	(-9.91)	(-3.59)	(-5.3)
Observations	4048	4048	4048
R^2	0.8523	0.2073	0.8305

5. Conclusions

This paper investigates if corporate cost of capital is affected by the degree of diversification. In order to research this issue, we construct three models to discuss the relationship between diversification strategy and cost of capital (cost of equity, cost of debt and weighted average of cost of capital). Our empirical results show that diversification strategy is unrelated to cost of equity capital, cost of debt capital and the weighted average cost of capital. This means that there is no evidence to confirm diversification strategy can reduce firm's risk, lower required rate of return of investors, reduce corporate cost of capital, implying that stakeholders are not convinced by the risk reduction through firms' diversification strategies. In addition, we apply robustness tests on regression analyses and the results remain the same. The contribution of our paper is to provide Taiwanese companies when they do the diversification decision making.

In the end, we are restricted to the company's future earnings per share forecasted by domestic analysts, instead of employing ex ante cost of equity capital as foreign research, we can only measure ex post cost of equity capital with CAPM model. For future researches, we expect there is sufficient database that can calculate ex ante cost of equity capital to do further discussions.

Note

1. We include $DTE_{i,t}$ in order to explain that, on average, cost of debt is lower than cost of equity. For consistency, we still include $Leverage_{i,t}$, since this variable was in our cost of equity and cost of debt models (Model (1) and (2)). However, when we remove $Leverage_{i,t}$ from the $COC_{i,t}$ regression (Model (3)), our results are unchanged.

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