



The impact of COVID-19 on the relationship between diversification and firm value

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Abstract

Introduction: Diversification, as a corporate strategy, is implemented by managers to enhance the performance of their organizations. It aims to bolster profitability through increased sales volume derived from the introduction of new products and expansion into new markets. Among the four strategies outlined in the Ansoff matrix, diversification represents the riskiest approach, demanding careful investment due to its association with considerable uncertainty and the need to acquire skills and techniques in foreign markets and product domains. Moreover, the outbreak of the COVID-19 pandemic has presented substantial challenges to firms, compelling managers to intensify their efforts in mitigating the adverse impacts of this global crisis on their operational activities

Objectives: This research aims to explore the relationship between diversification and firm value, taking into account the moderating influence of the COVID-19 pandemic.

Material and Methods: The study focuses on 172 firms listed on the Tehran Stock Exchange, from 2012 to 2021, over ten years. The data analysis employs ordinary least squares regression analysis in conjunction with fixed effects data approach to examine the research hypotheses.

Results: The findings of this study indicate that diversification strategies implemented by Iranian firms have resulted in an enhancement of firm value, as measured by Tobin's Q ratio. Furthermore, it is revealed that COVID-19 has played a moderating role in the relationship between diversification and firm value.

Conclusion: The empirical evidence suggests that the effects of the COVID-19 pandemic have diminished the positive impact of diversification on firm value.

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Introduction

Strategic management is pivotal in enabling organizations to adopt a proactive and innovative approach, steering clear of passive and inward-looking practices when shaping their future. The bedrock of strategic management decisions lies in managers' comprehensive understanding of competitor companies, markets, prices, suppliers, distributors, governments, stakeholders, and customers across the global landscape (1). These factors are critical to business success in today's dynamic business environment. Corporate diversification is a strategic management approach many managers employ to enhance their firm's performance. However, in the contemporary business world, corporate diversification continues to be viewed as a high-risk endeavor (2). Previous research has revealed a statistically and economically significant weak association in diversification (3). Some papers attribute this weak relationship to inefficient domestic capital markets within diversified firms (4,5).

Key point

COVID-19, as a global health crisis, shocked economies worldwide. Surveying the pattern of the economy in this period can be fruitful in facing other health crises in the future.

In contrast, others demonstrate the existence of agency costs resulting from a positive relationship between chief executive officer (CEO) compensation and diversification strategy (6,7).

The primary aim of implementing a diversification strategy within a firm is to enhance its performance and generate revenue by introducing new products. Extensive empirical research has been conducted over the years to examine the implications of diversification on value creation. These studies have yielded positive and negative findings regarding the effects of diversification on firm value. Several research endeavors have highlighted the negative impact of diversification on firm



value, emphasizing the presence of a discount associated with diversification (8-10). Conversely, other studies have explored the insurance value of diversification, suggesting that diversification can serve as a risk management strategy for firms. Several surveys shed light on this diversification aspect, emphasizing its potential benefits in mitigating risks (11,12). Furthermore, some studies have found a negligible relationship between diversification and firm value. Previously, Erdorf et al provided an example of such research, indicating that diversification may not significantly impact firm value in specific contexts (3).

The investigation into the relationship between diversity and firm value has spurred the exploration of various factors that may influence this connection, as the existing theoretical framework needs to provide a definitive answer to this question. Some studies propose that certain endogenous factors can impact diversity and its relationship with firm performance (13-15). Consequently, researchers must thoroughly examine firm characteristics before assessing the influence of diversity on firm value. However, the results remain inconclusive even after controlling for several endogenous factors. Meanwhile, Campa and Kedia demonstrate a positive impact of diversity on firm value (16), while Hoechle et al find negative results despite accounting for various endogenous factors (8). Thus, the existing literature offers potential avenues for investigating the ambiguous impact of diversity on firm value across different companies. Although the relationship between diversity and value has been extensively studied in developed markets, empirical research on emerging markets still needs to be conducted. In the context of emerging markets, some studies have examined specific endogenous factors that may influence the impact of diversity on firm value (17). Particular literature explores the role of ownership structure and corporate governance in elucidating this relationship. Nevertheless, their findings must be more conclusive, highlighting the need for further research to comprehend the link between diversity and firm value in emerging economies (18,19).

The emergence of the COVID-19 pandemic in late 2019 has triggered a profound transformation in people's lives and work worldwide. Traditionally, studies exploring economic shocks have focused on domestic economic disruptions within individual countries, with rare instances of universally shared conditions across nations (20). However, the COVID-19 pandemic has presented a unique global situation characterized by shared conditions (21). The consequences of the pandemic for companies have been far-reaching, as the imposed restrictions have resulted in sudden and widespread disruptions in the global economy. These disruptions have given rise to an adverse global economic shock, adversely impacting the financial markets of both developed and developing countries. These disruptions have disproportionately affected developing countries, particularly those with high

population density and underdeveloped healthcare systems (22). A recent research in the field of corporate finance has emerged to investigate the creation and erosion of firm value during the COVID-19 crisis (23). This research focuses on the role of diversity within companies and its influence on changes in firm value. Specifically, the study examines the impact of COVID-19 on the relationship between diversification and firm value (23).

Materials and Methods

Hypothesis 1: A statistically significant relationship exists between diversification and firm value.

Hypothesis 2: COVID-19 acts as a moderating role in the relationship between diversification and firm value.

The purpose of this research is inherently practical in nature. Within the realm of correlational research, it falls explicitly under the purview of regression analysis. Moreover, given that the data employed in this study is factual and historical, it can be categorized as ex post facto research. The statistical population for this study comprises companies listed on the Tehran Stock Exchange from 2012 to 2021. A purposive sampling method, specifically systematic elimination, was employed. This method involved selecting all eligible companies from the population as the sample while excluding others based on specific criteria. The data comparability was ensured by selecting companies with a fiscal year ending in December and maintaining consistency in their fiscal year throughout the research period. Active companies with available data on the research variables were included, while insurance companies, financial intermediaries, and banks were excluded. The resulting sample size was 172 companies after applying the cited restrictions. A library and documentary research method were initially employed for data collection, involving gathering theoretical foundations and research literature from specialized books and journals in English and Persian. Subsequently, the required data for testing the research hypotheses were extracted from financial reports, explanatory notes of selected companies, the Tehran Stock Exchange website, and other relevant databases. A Modern software tool, Rahavard Novin, was utilized to aid in data collection. The collected data were transferred to an extensive Excel spreadsheet, where necessary calculations were performed and prepared for analysis. The econometric software EViews was employed for the final data analysis.

Statistical analysis

Following the approach of Phang et al (24), the ordinary least squares regression model will be used to test the research hypotheses. The model is specified as follows;

Model 1:

$$Tobin - Q_{i,t} = \alpha_0 + \beta_1 Diver_{i,t} + \beta_2 COVID19_{i,t} + \beta_3 Diver_{i,t} * COVID19_{i,t} + \beta_4 BSize_{i,t} + \beta_5 LEV_{i,t} + \beta_6 FSize_{i,t} + \beta_7 BIndep_{i,t} + \beta_8 Div_{i,t} + \epsilon_{i,t}$$

In the above model:

Tobin-Q is the dependent variable, representing the Tobin's Q ratio, which is the ratio of the market value of equity and liabilities divided by the book value of assets.

Diver is the firm diversification variable. In this research, a qualitative variable is used, where 1 indicates the presence of a subsidiary unit and 0 otherwise (25).

COVID19 is the moderating variable, taking the value 1 for the years 2019, 2020, and 2021, and 0 for other sample years.

BSize represents the board size, which is the number of board members in the current year.

Indep indicates the independence of the board, calculated as the number of non-executive board members divided by the total number of board members in the current year.

Lev represents the leverage ratio, which is the total debt divided by the total assets at the end of the year.

FSize denotes the firm size, calculated as the natural logarithm of the total assets at the end of the year.

DIV is the dividend payout ratio, defined as the ratio of dividend payments to total assets.

Results

Table 1 presents a comprehensive overview of the descriptive statistics for the variables in the model. The findings reveal several essential insights. Firstly, the average firm value within the analyzed sample stands at 2.722. This implies that the aggregate market value of stocks and debts surpasses the book value of assets by a factor of more than two. The median value is 1.690, with a maximum value of 45.636 and a minimum of 38 percent observed in 2020.

Furthermore, the standard deviation 3.397 highlights a significant dispersion of observations around the mean. This indicates substantial variability within the dataset. Regarding the debt ratio, which indicates the proportion of debts with assets among the sample companies, it is observed that 55 percent of the sample's assets consist of

debts. The maximum value for this variable is 2.077, while the minimum values of 1% were recorded in 2012 and 2014, respectively. Regarding the independence of the board of directors, which reflects the presence of non-executive directors, the study shows that non-executive directors constitute 65 percent of all observations. This highlights their significant presence on firm boards throughout the study. Lastly, the diversification variable, denoted by binary values of zero and one, reveals that 40% of all observations (516) involve companies with subsidiary firms, signifying diversification in their operations.

Variance heterogeneity test

Based on the findings from the Pagan test, as displayed in Table 2, it is apparent that the research model exhibits variance heterogeneity, as indicated by the statistical significance of the calculated probability (p-value) being below the critical threshold of 0.05. To mitigate this issue, the researchers applied the extended generalized least squares (EGLS) method as a remedy.

Selection of diagnostic tests for model

In this research, the Limer's F-statistics is utilized as a diagnostic tool to distinguish between pooled data and panel data. The null and alternative hypothesis for this test are as follows:

H_0 : Selection of pooled data. H_1 : Selection of panel data.

If the alternative hypothesis (panel data) is chosen and validated, the Hausman test is then employed as a diagnostic test to differentiate between fixed effects and random effects. The null and alternative hypotheses for this test are as follows:

H_0 : Selection of fixed effects data. H_1 : Selection of random effects data.

According to Table 3, the results suggest that in hypothesis testing, fixed effects data should be employed.

Linear regression test

After estimating the coefficients, the Durbin-Watson

Table 1. Descriptive statistics of variables

Description	Mean	Median	Maximum	Minimum	Standard deviation	Variance
Firm value	2.722	1.690	45.636	0.385	3.397	5.774
Diversification	0.409	0	1	0	0.491	0.368
Board size	5.047	5	7	5	0.305	6.243
Board independence	0.653	0.600	1000	0.285	0.193	0.175
Debt ratio	0.558	0.554	2.077	0.012	0.226	0.647
Firm size	14.983	14.728	20.821	11.361	1.532	0.833
Earnings per share ratio	0.053	0.022	0.613	0	0.078	2.549

Table 2. Variance heterogeneity test

Model description	Chi-square statistic	Test result	P value
Research model	14.106	Existence of variance heterogeneity	0.000

Table 3. Results of the pooled data determination test

Model description	Test description	Statistic	Degrees of freedom	Test result	P value
Research Model	F Limer	0.967	171	Selection of panel data	0.000
	Hausman	19.365	8	Selection of panel data	0.012

statistic shows a value of 1.758, indicating the absence of serial correlation in the disturbance term. Consequently, the hypothesis does not suffer from the issue of serial autocorrelation. Prior to assessing the research hypothesis based on the obtained results, it is essential to validate the findings. To accomplish this, an F-test was employed to evaluate the overall significance of the model. With a significance level of 0.000 for the F-statistic, it can be confidently stated that the fitted regression model is statistically significant. Moreover, considering the determination coefficients of the fitted models, it can be argued that approximately 76% of the variations in the dependent variable can be explained by the independent variables. Collinearity, which implies that one independent variable is a linear function of the other independent variables, is an important condition to assess. The presence of multicollinearity suggests a high correlation among the independent variables, which may undermine the model's validity despite a high R-squared (R^2) value. However, in this case, all independent variables exhibit variance inflation factors (VIFs) less than 10 ($VIF < 10$). Consequently, no collinearity exists among the independent variables, thus validating the fitted model.

Hypothesis 1: There is a significant relationship between corporate diversification and firm value.

The analysis examines the relationship between diversification (independent variable) and firm value (dependent variable). Prior to conducting the pooled regression model using the Fixed Effects approach, the regression assumptions were assessed. Table 4 presents the results, showing that the estimated coefficient of the diversification variable is negative at a significance level of 91%. The absolute value of the t-test exceeds two, and the obtained significance level is below 5% (0.000).

These findings indicate a significant relationship between diversification and firm value. The negative coefficient suggests a direct positive relationship with firm value. Therefore, the research hypothesis is confirmed at a 5% significance level.

Hypothesis 2: The COVID-19 pandemic plays a moderating role in the relationship between corporate diversification and firm value.

To assess this hypothesis, the interaction coefficient of the diversification \times COVID-19 variable is utilized, along with its associated t-test. The results in Table 4 demonstrate that the estimated coefficient of the interaction variable is negative at a significance level of 92%. The absolute value of the t-test exceeds two, and the obtained significance level is below 5% (0.000). Consequently, it can be concluded that COVID-19 moderates the relationship between diversification and firm value.

Discussion

Benz and Hoang conducted an empirical investigation concerning the association between corporate diversification and capital structure. Their study encompassed data from 19 North American countries spanning the period from 1981 to 2015. Utilizing a linear model, the researchers presented compelling evidence of a substantial positive correlation between corporate diversification and capital structure (26).

In a separate study, Olibe et al delved into corporate diversification, debt maturity structures, and firm value. Through their analysis, they uncovered essential insights. Specifically, they found that a mere 1% increase in internal assets corresponded to a substantial 20.13% reduction in long-term debt. Moreover, they observed that a similar 1% increase in internal assets led to a significant

Table 4. Summary of statistical results of research model testing

Variables	Coefficient	Standard deviation	t-test	Significance level	Variance inflation factor
Width from the origin	14.172	1.348	10.508	0.000	-
Diversification	0.919	0.160	5.737	0.000	1.712
COVID-19	-4.160	0.122	-33.984	0.000	1.939
Diversification \times COVID-19	0.928	0.117	-7.892	0.004	1522
Board size	0.239	0.172	1.392	0.164	1.015
Board independence	0.210	0.263	0.799	0.424	1.058
Debt ratio	0.176	0.219	0.802	0.422	1.197
Firm size	0.971	0.06	-15.078	0.000	1.387
Earnings per share ratio	1.159	0.610	1.900	0.000	1.228
F-statistic	14.060		Durbin-Watson test		1.758
Significance level of F-statistic	0.000		Adjusted R-squared		0.576

16.66% rise in short-term debt (27). Interestingly, their findings demonstrated a gradual positive relationship between external support and Tobin's Q, implying that foreign investment is an effective avenue for augmenting shareholders' equity value. These results contrast the theory put forth by Denis et al (28).

Furthermore, Olibe et al examined a distinct sample and made noteworthy observations concerning the impact of debt fluctuations on the pricing of foreign assets. They also showcased a positive correlation between external assets and a high debt-to-asset ratio based on Tobin's Q (27). However, this correlation did not hold significance for companies with an average debt-to-asset ratio and proved inconsequential for companies with a low debt-to-asset ratio. Consequently, the vast majority of investment companies refrain from engaging in discounted sales transactions.

The study by Krivokapic et al examined the relationship between diversification and the performance of insurance firms in the Republic of Serbia from 2004-2014. They aimed to examine the connection between diversification and the performance of insurance companies in Serbia. The research findings revealed a significant and positive association between risk-adjusted returns, measured through asset returns and capital returns, and entrepreneurship and business, measured by entropy. These results indicate that certain insurance companies outperform others in performance (29).

In another study by Chen and Yu, the researchers investigated the relationship between diversification strategy and performance by selecting 98 listed companies in the Taiwan stock market from 1996 to 2001. Their findings indicated a positive and significant correlation between diversification and profitability in developing markets (18). Anil and Yiğit researched organizational diversity by analyzing 342 listed companies in Turkey from 2005 to 2009. Their study revealed a significant distinction among different types of diversification strategies and performance measures, including asset returns and sales returns (30). Businesses with homogeneous diversification exhibited the highest returns, while concentrated businesses had the lowest returns. In a study conducted by Hsu and Liu on 124 software companies listed in the Taiwan stock market from 1997 to 2002, the researchers concluded that diversity positively and significantly impacts firm profitability (31).

The global economy has experienced significant adverse consequences due to the COVID-19 pandemic, leading to a substantial economic shock. One of the areas profoundly affected by this pandemic is the Iranian stock market, which has witnessed a decline. The outbreak of COVID-19 triggered an immediate global crisis, with the International Monetary Fund (IMF) projecting a -4.9% global economic growth, a significant decrease of 7.6% compared to the previous year's forecast. Furthermore, approximately 170 countries have encountered a decline in per capita income

due to the pandemic (32).

The impact of COVID-19 on the global economy can be attributed to three primary channels; 1) budgetary constraints and reduction in the gross domestic product (GDP) of countries, 2) disruptions in international trade, and 3) repercussions on financial markets. These channels have played a crucial role in shaping the adverse economic outcomes observed worldwide (22,33).

Conclusion

The findings of the hypothesis test conducted in this study reveal a significant and positive association between diversification and firm value. The introduction of diversified products within a firm contributes to the acquisition of diverse production expertise and generates increased income by selling various products. This, in turn, leads to an expansion of the firm's market share and ultimately enhances its overall value. Additionally, the presence of individuals with different areas of expertise within the organization produces higher-quality products at reduced costs, thereby further contributing to the increase in the firm's value. Furthermore, the results of this hypothesis test provide empirical support for both the agency theory and the theory of free cash flows in the Iranian capital market.

Suggestions

- Senior managers are advised to comprehensively assess their current position, including analyzing strengths, weaknesses, opportunities, and threats, when considering the strategic adoption of a diversity strategy. Subsequently, with a clear vision, if they ascertain that diversity is conducive to achieving organizational objectives, they should proactively undertake endeavors to expand the scope of their business.
- It is imperative to thoroughly scrutinize organizational factors and mechanisms and select diversity measures that align harmoniously with internal mechanisms such as cultural norms, personnel composition, financial resources, management styles, and other pertinent aspects.
- The outcomes of adopting either a diversity-oriented or concentration-oriented approach may not manifest immediately. Therefore, managers should account for a temporal gap and exercise restraint in prematurely evaluating the effectiveness and efficiency of the chosen strategy.
- Suppose managers express a proclivity towards embracing diversity. In that case, it is recommended that they establish the necessary foundational prerequisites to reap the benefits associated with diversity, including considerations such as organizational size, management capabilities, and skill sets.

Authors' contribution**Conceptualization:** Morteza Damarcheli and Zahra Kalantari.**Data curation:** Morteza Damarcheli and Zahra Kalantari.**Formal analysis:** Morteza Damarcheli and Zahra Kalantari.**Investigation:** Morteza Damarcheli and Zahra Kalantari.**Methodology:** Morteza Damarcheli and Zahra Kalantari.**Resources:** Morteza Damarcheli and Zahra Kalantari.**Validation:** Morteza Damarcheli and Zahra Kalantari.**Writing—original draft:** Morteza Damarcheli and Zahra Kalantari.**Writing—review & editing:** Morteza Damarcheli and Zahra Kalantari.**Conflicts of interest**

The authors declare that they have no conflicts of interest.

Ethical issues

This study was extracted from the MSc thesis of Zahra Kalantari at Allameh Tabataei University (Thesis#55791215). Moreover, ethical issues (including plagiarism, data fabrication, and double publication) were completely observed by the authors.

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