Empirical Analysis of Fractional Differential Model of the Relationship between Enterprise Management and Financial Performance

Yi Li

School of Business Administration, Qinghai Nationalities University, Xining, Qinghai Province, China

Keywords: Enterprise Management; Financial Performance; Differential Model; Empirical Analysis

Abstract: For a long time, the intermediary relationship between management control and enterprise performance, as well as the positive and negative interweaving of empirical results, makes the theoretical circles in a sense do not really reflect the important role of management control in the development of enterprises. This paper aims to embody the importance of management control and highlight the two-way role of non-financial performance which has been neglected by academia. It is based on Merchant's comprehensive theoretical framework of management control. Taking small and medium-sized enterprises in Xinjiang as samples, this paper explores the relationship between management control (behavior control, result control, personnel control) and enterprise performance (non-financial performance, financial performance) by establishing structural equation model and hierarchical regression model. The results show that results control and personnel control are helpful to improve corporate performance, and non-financial performance has a positive impact on corporate financial performance.

1. Introduction

With the popularization of global competition, the main problem that most enterprises in today's global business community still face is to achieve organizational goals by controlling employees and activities of enterprises. However, the environment of enterprises is changing constantly, which requires enterprises to improve management quality and performance level in an open market, so as to enhance the value of enterprises [1-2]. However, at present, many enterprises do not correctly recognize the importance of management control to the development of enterprises, some believe that the implementation of management control has cost, while some enterprises do not correctly understand the essence of the implementation of management control, just blindly to implement [4]. One of the important reasons may be the insufficient supply of theoretical support of management control to improve enterprise performance. Although this research has achieved fruitful results, it seems that the theoretical circles do not really reflect the important role of management control in the development of enterprises because of the intertwined positive and negative research results [5-6]. For the first time, this paper makes an empirical study on the types of the relationship between management control and enterprise performance by using structural equation model.

2. Sample Selection and Data Generation

The subjects of this study are leaders or financial personnel of small and medium-sized enterprises of Han, Uygur and Hui nationalities in Xinjiang (Urumqi, Changji, Korla, Hami, Aksu, Kashgar and Hetian) [7]. The reason for choosing these areas is that the specific items of the scale of ethnic cultural values and management control methods are designed according to the questionnaire based on the ethnic concentrated residence in Xinjiang [8-9]. The questionnaire was designed as a 7-level Richter scale. 200 questionnaires were sent out to three ethnic groups, and 441 questionnaires were recovered (158 from Han, 145 from Uygur and 138 from Hui).

  DOI: 10.25236/mfssr.2019.089

2.1 Selection and measurement of variables

(1) Internal and external variables: non-financial performance (NFP)

The measurement method of non-financial performance of enterprises is to get the score by factor analysis based on questionnaire data. On the dimension of measuring financial performance, this paper involves customer satisfaction, customer satisfaction, market share and punctual delivery. The measurement method of enterprise non-financial performance is based on questionnaire survey data and factor analysis to get the score.

(2) Internal variables: financial performance (FP)

On the dimension of measuring financial performance, this paper deals with ROA, cash flow/sales revenue, sales cost/sales revenue, (sales expenses + management expenses) / sales revenue, sales revenue growth rate. The score of each dimension is the company's actual performance in the most appropriate number for the previous year.

(3) Exogenous variables

The explanatory variables are based on Merchant & Vander Stede's theoretical framework of management control. The results of research (RC), behavior (AC) and personnel control (PC) are presented respectively. The measurement method is to get the score by factor analysis based on the questionnaire data.

(4) Control variables

In order to control the influence of other factors on management control mode and enterprise performance, this chapter designs the following control variables: nationality, educational background, enterprise nature and total assets.

2.2 Mediation model and regulation model

According to the basic research model, this paper regards non-financial performance as an intermediary variable between management control and corporate financial performance. Behavior control, result control and personnel control have an impact on non-financial performance, and non-financial performance has an impact on financial performance. Non-financial performance plays an intermediary role between management control and financial performance [10-12]. Similar to the intermediary model, the moderating model takes non-financial performance as a moderating variable of behavior control, result control and personnel control and enterprise financial performance. Behavior control, result control and personnel control can influence the financial performance of an enterprise, and this influence can be moderated through the non-financial performance of an enterprise.

The difference between the two models is that the intermediary model assumes that management control has an indirect impact on financial performance, but it may also have a direct impact on financial performance [13]. However, the indirect impact is greater than the direct impact. The difference between the two models can be seen in Figure 1.

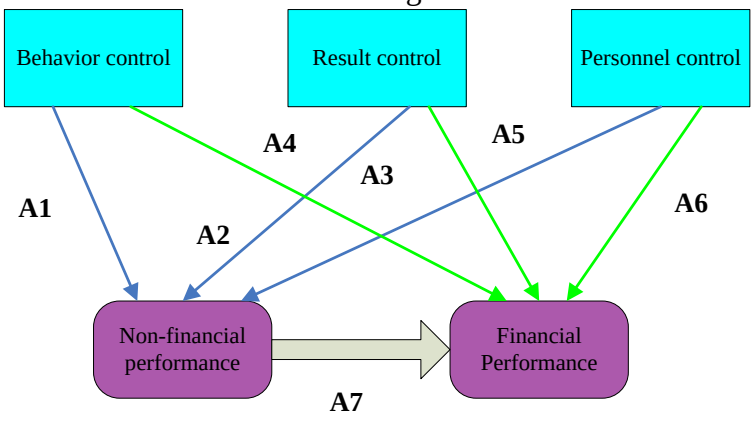

Figure 1. Mediation model

For a better understanding, refer to Figure 3. A1, A2 and A3 represent respectively the influence

of behavior control, result control and personnel control on non-financial performance. A4, A5 and A6 are three dotted lines, which indicate that the impact of the three controls on financial performance is indirect rather than direct. A7 represents the direct impact of non-financial performance on financial performance. B1, B2 and B3 represent the influence of behavior control, result control and personnel control on financial performance, while B4, B5 and B6 represent the catalytic role of non-financial performance. Hypothesis 1, hypothesis 2, hypothesis 3, hypothesis 4, Hypothesis 5 and hypothesis 6 can be verified by the positive and negative coefficients of model 1 and model 2 in model 3. For Hypothesis 7 and 8, if the relationship between mediation models A1 and A7, A2 and A7, A3 and A7 is significant, and A4, A5 and A6 are not significant, then the mediation model is valid. At least one pair of relationships between B1 and B4, B2 and B5, B3 and B6 are significant, which indicates that the regulation model Figure 2 is valid.

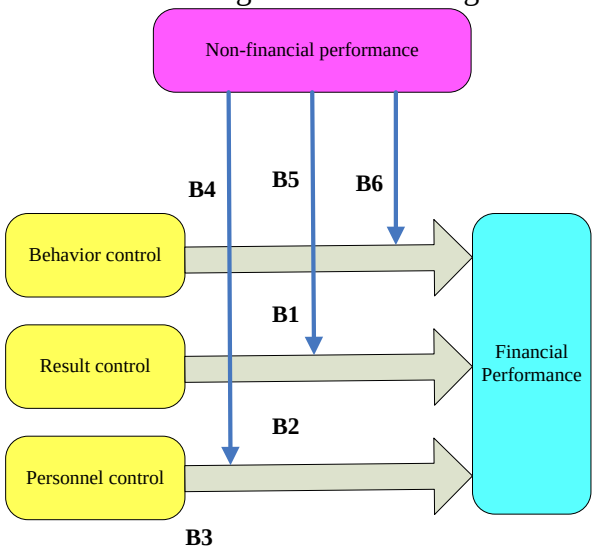

Figure 2. Adjustment model

3. Empirical Analysis Design

The purpose of this paper is to explore the relationship between IFC environment and social risk management and enterprise growth (financial performance). Autoregressive Distribution Lag Model (ARDL) is used to analyze the relationship.

$$CFP_t = \alpha_0 + \sum_{i=1}^{m} \alpha_i CFP_{t-i} + \sum_{j=1}^{n} \beta_j ESG_{t-j} + \rho_t ControlVariables_t + \varepsilon_t$$

$$\varepsilon_t \sim IN\left[0, \sigma_n^2\right]$$

Among them, CFP represents financial performance variables; ESG represents environmental and social risk measurement indicators; Control Variables represents control variables; m and N are the maximum lag periods of CFP and ESG respectively.

ARDL model was proposed by Pesaran and Shin in 1996, and has been extended in a series of research results since then. The emergence of ARDL model provides an effective tool for studying the long-term relationship between variables. The advantage of this model is that compared with the standard co-integration model, ARDL model does not need the time series of each variable to be monolithic in the same order. Even if the sample size is in a non-stationary state, ARDL model can be used to test the long-term relationship between variables, and the effective and consistent estimation results can be obtained.

The measurement of environmental and social risk management is the key and difficult point of this paper. This difficulty was solved by the project evaluation system established by IFC. IEG tracks and independently evaluates the development results at all stages of the project cycle, and evaluates the environmental and social performance of the project with 27 indicators. The results

are shown in Figure 3.

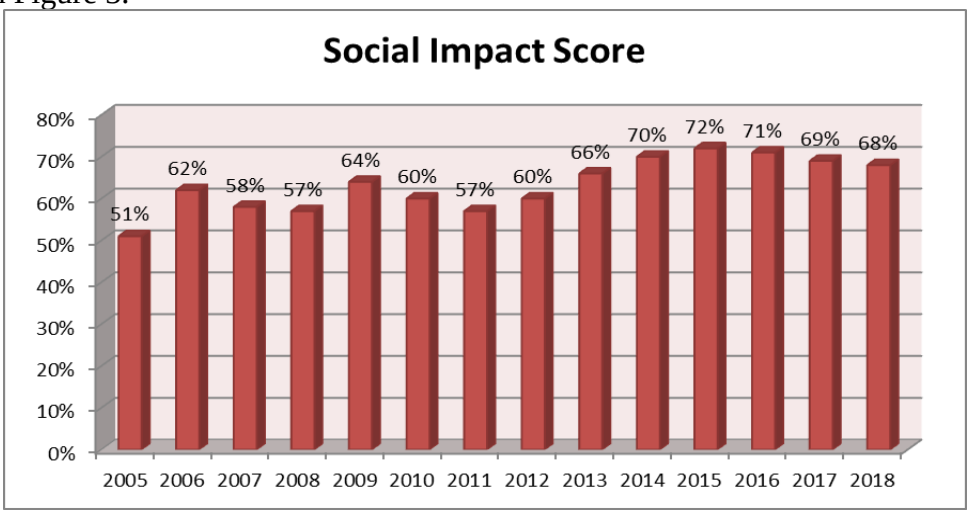

Figure 3. Environmental and social impact score

At present, the indicators used to measure the financial performance of enterprises can be divided into two categories: market income indicators and accounting indicators. Among them, the market income indicators are mainly based on the transaction data of the capital market, reflecting the returns to shareholders. If we use market income index to test the relationship between sustainable development and financial performance of enterprises, we must consider the issue of market effectiveness. If a firm's commitments to sustainable development can indeed improve its financial performance, its share price should change rapidly once the information about the firm's commitment to sustainable development is transmitted to an effective market. Therefore, as an indicator of corporate financial performance, market returns can be used to analyze the impact of sustainable development on corporate financial performance by event study method.

Accounting is mainly based on the company's financial statement data, reflecting the operating results of the whole company, not just from the perspective of shareholders. In addition, this paper aims to explore the long-term relationship between environmental and social risk management behavior and corporate financial performance. Therefore, this paper uses accounting indicators to measure corporate financial performance. Among the many financial indicators of enterprises, according to the combing of relevant literature by Griffin and Mahon, this paper chooses the return on assets (ROA) which reflects the profitability of enterprises as the main variable of financial indicators.

Table 1. ARDL model estimation results

Variable	Parameter estimation	T statistic
DROA(-1)	0.2961323	0.3965
DROA(-1)	0.5084237	-0.8856
DROA(-1)	-0.3584237	0.85645
DLNTA	0.2546	-2.7958
DLNTA(-1)	0.22896	-3.1565
DLNTA(-2)	0.14897	1.7964
DLNTA(-3)	0.08578	0.55986
DESG	-0.23986	1.2658
DESG(-1)	-0.08543	-1.0652
DESG(-2)	0.15859	-0.4795
DESG(-3)	0.11654	-3.2589

4. Empirical Analysis and Result Discussion

Firstly, the stationarity test is carried out, and ADF test is adopted in this paper. According to the ADF test of unit root, the time series of ROA, LNTA and DTA3 are all non-stationary. In this paper, Johansen test is used to find the co-integration relationship among these three variables. The results of co-integration rank test show that there is only one linear independent co-integration vector, that

is to say, there is a unique co-integration relationship.

In view of the limited sample data, according to the adjusted resolvable coefficients, AIC, SC criteria after regression with different lag periods, the number of lag periods is 3. The estimated results of ARDL model are shown in Table 1.

The long-term co-integration relationship between environmental and social risk management and financial performance is as follows:

$$ROA = 1.732 + 0.183LNTA + 0.166ESG + 0.368DTA$$

Because ARDL introduces the lag time of the interpreted variables to the right of the equation, LM test and White heteroscedasticity test are needed for the residual sequence of the regression equation. The results show that there is no Heteroscedasticity in the residual sequence and the assumption of no autocorrelation is accepted (see Table 2). Therefore, the above regression results are reliable.

Table 2. Heteroscedasticity test results

Lag	Chi2	Prob>Chi2
1	4.2695	0.67965
2	6.1876	0.36598
3	10.3753	0.13698

That is to say, in the long run, IFC's environmental and social risk management policies and implementation measures have a positive impact on its financial performance; however, the current and lagging environmental and social risk management of the first and second phases have no significant positive effect on financial performance, and even have a negative effect, until the lagging third phase, it shows a positive effect on corporate financial performance. This result is easy to understand. Environmental and social risk management needs to consume company resources, especially for specific projects, which will increase certain costs and damage direct economic interests in the short term, that is, it will show negative effects on financial performance. In the long run, the implementation of environmental and social risk management, the comprehensive improvement of IFC's risk management ability, personnel professionalism and so on, all of these improvements have enhanced the “soft power” of IFC operation. This kind of “soft power” enhancement often takes a certain amount of time to accumulate, which is difficult to show in the short-term economic benefits. That is, the positive effect of environmental and social risk management on economic performance will lag behind in time.

5. Conclusion

The results show that results control and personnel control are helpful to improve corporate performance, and non-financial performance has a positive impact on corporate financial performance. Excessive behavior control will not be conducive to improving the performance of enterprises. However, in an enterprise with high use of behavioral control, enterprises can reduce the negative impact of behavioral control on financial performance by improving non-financial performance. The results show that non-financial performance plays a two-way role between management control and corporate financial performance, highlighting the necessity of non-financial performance. This study also shows that SMEs rely heavily on behavior control in three kinds of management control, but less on result control and personnel control.

Acknowledgement

The research in this paper was supported by The National Social Science Fund of China:

Research on Promoting Middle-income Income Growth in Qinghai-Tibet Region (NO. 17BJY041)

References

[1] Maqbool S , Zameer M N . Corporate social responsibility and financial performance: An empirical analysis of Indian banks[J]. Future Business Journal, 2018, 4(1):84-93.

[2] Wang B Q , Yang X C . Analysis of the Relationship Between Company's Growth and its Financial Performance Empirical Evidence from the Sample of Listed Companies of Strategic Emerging Industries in Anhui Province [J]. Journal of Applied Sciences, 2013, 13(18):3857-3861.

[3] Chen, Cathy Yi-Hsuan, Chiang T C. Empirical Analysis of the Intertemporal Relationship between Downside Risk and Expected Returns: Evidence from Time-varying Transition Probability Models [J]. European Financial Management, 2016, 22(5):749-796.

[4] Yu D, Yan-Mei X U, Yi P . Empirical Analysis of the Relationship between Brand Marketing Strategies and Market Orientation of Agri-tech Enterprises[J]. Journal of Shihezi University, 2013, 362:766-771.

[5] Nimtrakoon, Sirinuch. The relationship between intellectual capital, firms' market value and financial performance [J]. Journal of Intellectual Capital, 2015, 16(3):587-618.

[6] Endrikat J , Guenther E , Hoppe H . Making sense of conflicting empirical findings: A meta-analytic review of the relationship between corporate environmental and financial performance [J]. European Management Journal, 2014, 32(5):735-751.

[7] Dinu V, Nedelcu M . The Relationship between the Audit Committee and the Financial Performance, the Asset Quality and the Solvency of Banks in Romania[J]. Transformations in Business & Economics, 2015, 14(2):80-96.

[8] Sardo F , Zélia Serrasqueiro. A European empirical study of the relationship between firms' intellectual capital, financial performance and market value[J]. Journal of Intellectual Capital, 2017, 18(4):771-788.

[9] Gontis V , Kononovicius A . Burst and inter-burst duration statistics as empirical test of long-range memory in the financial markets[J]. Physica A: Statistical Mechanics and its Applications, 2017, 483:262-272.

[10] Ramalho J J S , Silva J V . Functional form issues in the regression analysis of financial leverage ratios[J]. Empirical Economics, 2013, 44(2):799-831.

[11] Caporale G M , Gilalana L A . Long memory and fractional integration in high frequency data on the US Dollar / British Pound spot exchange rate[J]. International Review of Financial Analysis, 2013, 29(5):1-9.

[12] Ke R , Ng M K , Sun H W . A fast direct method for block triangular Toeplitz-like with tri-diagonal block systems from time-fractional partial differential equations[J]. Journal of Computational Physics, 2015, 303(C):203-211.

[13] Caporale G M , Gil-Alana L , Plastun A , et al. Long memory in the Ukrainian stock market and financial crises[J]. Journal of Economics and Finance, 2016, 40(2):235-257.