R&D spending value effect research of China’s listed manufacturing companies

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ARTICLE DETAILS

ABSTRACT

In this paper, taking example for the manufacturing-listed companies in China, studies the value effect of R&D expenditure. China is a manufacturing power, so the optimization and upgrading of manufacturing industry is the key to accelerating the transformation of economic development pattern and driving the economic development into a more efficient direction. And R&D expenditure is the key to the optimization and upgrading of manufacturing industry. Hence, as for manufacturing-listed companies, the research about the value effect of R&D expenditure has both theoretical significance and practical significance.

The content structure of this article is as follows: the second part is the literature review and research hypothesis; the third part is the research design; the fourth part is the empirical result; the final part is the conclusion.

2. Literature review and research hypothesis

2.1 The R&D expenditure and market value of manufacturing-listed companies

Lots of literatures confirmed that the R&D expenditure showed a positive correlation with the market value of listed companies [1]. However, some empirical evidence didn’t support the positive correlation between them. Erickson and Jacobson (1992) found that R&D expenditure did not contribute to the company’s market value just like other expenditures [2]. Some scholars studied the relationship between the investment in scientific research and enterprise performance, and the results showed that the above relationship in information industry and manufacturing industry was not obvious. Through the empirical analysis based on the data of the listed companies in manufacturing industry and information technology industry from 2005 to 2008, some scholars found that R&D expenditure showed a negative correlation with the performance of listed companies at that time [3,4]. With the above arguments, we propose the first hypothesis (expressed in the form of null hypothesis):

Hypothesis 1: the R&D expenditure of the manufacturing companies in China is irrelevant to their market value.

2.2 The size effect of manufacturing-listed companies

Connolly and Hirschev’s study confirmed the value effect of R&D expenditure was closely related to the company’s size, and their empirical result showed that the value effect from R&D expenditure in large enterprises was greater than that in smaller enterprises [3]. Jefferson et al. (2006) used the panel data of Chinese manufacturing enterprises to empirically analyze the determinants of R&D input intensity, R&D output function and the impact of R&D on corporate performance, and the study found that R&D expenditure mainly focused on large capital-intensive enterprises [4]. Some studies showed that the role of R&D expenditure could be influenced by the firm size, but only the R&D expenditure of small enterprises had significantly positive correlation with enterprise value. On the basis of above arguments, we propose the second hypothesis:

Hypothesis 2: the value effect of R&D expenditure in Chinese manufacturing-listed companies is irrelevant to the company size.

2.3 The ownership effect of R&D expenditure in manufacturing-listed companies

Most economists have long since believed that state-owned companies operate less efficiently than private ones. State-owned enterprises’ pursuing specific social and political goals rather than maximizing profits causes above phenomenon. Boycko et al. (1996) believed that political pressure forced state-owned companies to hire more employees [5]. Krueger (1990) believed that state-owned enterprises employed politically connected people rather than those who were best for the job [6]. While Vickers and Yarrow (1991) argued that state-owned companies didn’t operate less efficiently than private ones, because there were also serious principal-agent problem in private enterprises, especially in large ones. Empirical studies also did not give consistent evidence, and a large number of studies have shown that private companies operated less efficiently than state-owned ones, while much evidence showed that result was not true [7,8]. Based on these arguments, we propose the third hypothesis:

Hypothesis 3: the value effect of R&D expenditure in Chinese
manufacturing-listed companies is no different in state-owned and non-state-owned enterprises.

3. Research design

3.1 Regression model

In order to examine above hypotheses, we adopt following regression equation:

\[ MV_{i, t} = \alpha_0 + \alpha_1 RD_{i, t} + \alpha_2 AD_{i, t} + \alpha_3 E_{i, t} + \alpha_4 D_{i, t} + \epsilon_{i, t} \]  

(1)

\( i \) represents the company, \( t \) represents the year, the dependent variable \( MV \) represents market value, \( RD \) represents R&D expenditure, \( AD \) represents advertising expenditure, \( E \) represents total profits, \( D \) represents dividend, \( BF \) represents equity financing, \( \epsilon \) represents error term.

Equation (1) is the extended form of Ohlson (1995) theoretical model. His research suggests that a company's market value can be shown as a linear equation including the surplus, book value and shareholders' net cash flow (the dividend subtracts the equity financing). We add \( AD \), the advertising expenditure variable, on the right of Ohlson model, because lots of literature confirmed that \( AD \) expenditure would affect a company's market value [9, 10]. We add \( RD \), the R&D expenditure variable, on the right of the model, and R&D expenditure is a key variable in this paper. If R&D expenditure has value effect, the regression coefficient \( \alpha_1 \) will be not significant zero. In order to reduce the heteroscedasticity, each continuous variable in equation (1) is deflated by the book value [10].

3.2 Data, samples and descriptive statistics

In this paper, the data is from two aspects: the data of R&D and advertising expenditure is from the corporate annual reports in the websites of Shanghai Stock Exchange and Shenzhen Stock Exchange. Other data, including financial data and market data, is derived from CSMAR of Shenzhen GTA Education Tech Ltd. We delete the following firm-year observations: the observations whose book values are negative, the observations missing R&D expenditure variable and the observations missing other variables.

The samples in this paper are the listed companies in Shanghai and Shenzhen A stock market from 2001 to 2014. In addition to the companies' market capitalization, other variables are derived from the companies’ financial statements of the year. The current accounting system in China asks listed companies to publish the financial statements of the years before April 30 every year. In order to make financial data and market data match each other, we use financial data of the previous year to match the market data. The sample period from 2001 to 2014 covers almost all the samples in China’s manufacturing listed companies. Moreover, the regression results confirm several scholars’ research on American listed companies [1].

4. Empirical result

Table 3 gives a regression result about the impact of R&D expenditure on the market value of listed companies. Among all the regression analyses, in order to deal with potential heteroscedasticity and sequence related issues, all the standard deviations of regression coefficients are processed by Cluster on the enterprise level.

4.1 The impact of R&D expenditure on the market value of listed companies

Through the regression analysis of the overall sample based on least square method, it can be found that after controlling \( AD \) expenditure, surplus, dividend, equity financing, annual fixed effect and industrial fixed effect, R&D expenditure is not conspicuous zero at 1% level and the regression coefficient is 42.78. This indicates that R&D expenditure will significantly promote the market value of manufacturing-listed companies. Because we control the company surplus while regressing, the coefficient of R&D expenditure can be regarded as a long-term impact on the company value, so we can see R&D expenditure as intangible assets investment in the future cash flow of the company.

The empirical results of table 3 rejects hypothesis 1, which show that the R&D expenditure is positively correlated with the market value of manufacturing-listed companies. Moreover, the regression results confirm several scholars’ research on American listed companies [1].

4.2 The impact of R&D expenditure on the market value of listed companies: the size effect

In this paper, the samples are divided into small enterprises, medium-sized enterprises and large enterprises according to the market value of listed companies. As we can see, although the R&D expenditure of large enterprises shows a significantly positive correlation with the market value, it is just conspicuous in about 10% level. Additionally, small enterprises and medium-sized enterprises are not conspicuous zero at 1% level. As for the coefficient size, that in large enterprises (16.91) is also far below that in medium-sized enterprises (52.43) and small enterprises (45.73).

Above all, the empirical results in Table 3 show that the value effect of R&D expenditure in Chinese manufacturing-listed companies is related to the company size. And the performance of small enterprises and medium-sized enterprises is better than large ones. The Research by Griliches (1990) showed that small firms’ R&D efficiency [measured by patents per unit of R&D] was higher than that of large firms [11].

The Research by Connoly and Hirschy (2005) also confirmed the value effect of R&D expenditure is closely related to the company size, but their empirical results showed that the value effect of R&D expenditure is greater than that in small firms. Some recent researches also showed that the value effect of R&D expenditure only existed in small firms. Their research samples only contained the listed companies in Shanghai and Shenzhen A stock market in 2009, while our samples covered all non-financial listed companies in Shanghai and Shenzhen A stock market from 2001 to 2009. So we believe that the empirical results in this paper are more credible.

Table 3. The impact of R&D expenditure on market value of listed companies

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for all the continuous variables, we take the logarithm and make a regression, and the results are similar to the results in this paper. Based on these tests, we believe the empirical results in this paper are robust.

5. Conclusion

Through studying the impact of R&D expenditure on the market value of firms according to the data of manufacturing-listed companies in Shanghai and Shenzhen A stock market from 2001 to 2014, we find that the R&D expenditure of manufacturing-listed companies shows a positive correlation with the market value. And R&D expenditure can generate greater value effect in smaller firms. Finally, this paper finds that the value effect of R&D expenditure in private enterprises is greater than that in state-owned enterprises.

Since R&D expenditure has value relevance, this means that it can be the reference for market participants to estimates the market value of listed companies in China, such as the selection of investment targets, etc. Moreover, R&D expenditure can also provide policy makers with decision basis, such as the disclosed policies about R&D expenditure and the reform of state-owned enterprises.

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