The Impact of External Financing on the Growth of New Energy Automobile Enterprises

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Abstract. With the rapid development of China's new energy vehicle industry in recent years, external financing can provide financial support for the growth of new energy vehicle companies, which is crucial for technological innovation and production scale expansion. Based on the data of China's new energy vehicle listed companies, this paper uses the panel regression model to study the impact of external financing on corporate growth. The results show that external financing can significantly improve the growth ability of enterprises, and at the same time, external financing also has a significant positive impact on corporate R&D investment.

Keywords: External financing; New energy vehicles; Enterprise growth; R&D input.

1 Introduction

With the improvement of national environmental awareness and the upgrading of industrial structure, new energy vehicles have replaced fuel vehicles and have developed rapidly in the international market. China began to promote new energy vehicles in 2009, and the new energy vehicle industry has experienced rapid growth, with domestic wholesale of new energy passenger vehicles exceeding 100,000 for the first time in 2015, reaching a year-on-year increase of 202%. In the following years, the sales of new energy vehicles continued to grow, and in 2023, the production and sales of new energy vehicles in China exceeded 9 million, ranking first in the world for 9 consecutive years. In the rapid development of the new energy vehicle industry, external financing plays an indispensable role. Technological innovation is the core driving force for the development of the industry, and this process requires huge initial investment and continuous financial support to achieve technological breakthroughs and product upgrades. In addition, the production and promotion of new energy vehicles require a large amount of investment in basic equipment, including manufacturing facilities, R&D centers and charging networks, which require long-term and large-scale capital investment. Corporate finance not only provides the necessary capital for these key areas, but also lays the foundation for long-term sustainable development by reducing financial risks, attracting high-end talent, and strengthening market competitiveness.

Q. Wu et al. (eds.), *Proceedings of the 2024 3rd International Conference on Public Service, Economic Management and Sustainable Development (PESD 2024)*, Advances in Economics, Business and Management Research 309,
https://doi.org/10.2991/978-94-6463-598-0_30

Based on the data of China's new energy vehicle listed companies, this paper studies the impact of external financing on the growth of enterprises and its role path by constructing a panel regression model, in order to put forward decision support suggestions for the development of China's new energy vehicle enterprises.

The second part is literature review, and the third part is research hypothesis and model setting. The fourth part is empirical analysis; Finally, conclusions and recommendations are proposed.

2 Literature Review

In terms of the impact of external financing on firm growth, a lot of research has been done on the impact mechanism and the heterogeneity of the impact on different types of firms. Santos(2024) [6] surveyed the effects of different kinds of external financing on economic growth. Hong et al. (2023)[2] uses the principal component analysis (PCA) methodology to study the relationship among corporate governance, external financing and earnings management in emerging markets. It is concluded that external financing activities can stimulate earnings management of listed companies in Vietnam. Li et. al. (2023)[3] studied the impact of green finance on private enterprises by using the differentially differential model, and found that green credit policies limited the development of heavily polluting private enterprises. Zhou et. al. (2023)[4] research on the tiered system in the National Equities Exchange and Quotations, and found that financing enhances the influence of small and medium-sized enterprises, especially technology enterprises in the industry.

Using qualitative and quantitative methods, Demiri (2022)[5] analyzed the importance of bank loans as a source of financing for SMES in Kosovo and North Macedonia. It is concluded that bank loan is the main source of external financing for SMES.

In the field of new energy vehicles, due to its short development time in the world, due to the lack of relevant data support for some studies, more of them use the theoretical analysis framework of game theory models, and a small number of articles analyze the various factors affecting the development of new energy vehicle enterprises from a quantitative point of view. Calabrese (2016) [1] described the development prospects of new energy vehicles Song et al. (2023)[7] used tripartite evolutionary game model, exploring the interplay of new energy vehicle enterprises, consumers, and government in the context of the "dual carbon" target. The conclusion is that there is a strong correlation between government subsidies and the production and sales of new energy vehicles. Tang et al. (2024)[8] based on the study of a three-party evolutionary game, studied the promotion of new energy vehicles in the post-subsidy era and came to the conclusion that the promotion of new energy vehicles, The government must adopt other policies to offset the cost increase caused by the reduction in subsidies. He et. al. (2024)[9] constructed a ridge regression model with the sales of new energy vehicles, while seven main factors affecting the development of new energy electric vehicles were studied. They found the penetration rate of new energy vehicles is the biggest factor affecting the development of new energy vehicles. Miao et. al. (2023)[10] based

on the evolutionary game the theory, analyzed the tripartite game of new energy automobile manufacturers under the background of dual-carbon credit policy. The conclusion is that the strategic choice of the three parties is conducive to the government's production of new energy vehicles, and it is also conducive to consumers' choice of new energy vehicles.

Judging from the existing literature, although there have been a lot of theoretical and empirical studies on the impact of external financing on enterprise growth, new energy vehicle enterprises have certain particularities, in the context of carbon neutrality, on the one hand, they are supported by green finance policies, but on the other hand, their R&D and infrastructure investment also need a lot of financial support, and there is a certain cash flow risk. There is little literature on the characteristics of the new energy vehicle industry, and quantitative analysis is carried out. Therefore, this paper will further discuss the impact of external financing on the growth of new energy vehicle enterprises on the basis of existing research.

3 Research Hypotheses and Model Design

3.1 Hypothesis

The impact of external financing on the growth of new energy vehicle enterprises is mainly reflected in the following aspects: First, financing activities provide capital accumulation for enterprises, which is the basis for technological innovation and product research and development, and helps enterprises achieve technological breakthroughs and product iterations. Secondly, the injection of external funds reduces the financial risks faced by enterprises in the process of R&D and marketing, and enhances the resilience of enterprises to market fluctuations. Finally, financing can also help companies attract and retain key talent and build core competencies, so as to gain an advantage in the fierce market competition and promote the sustainable development of enterprises. Therefore, we propose hypothesis 1.

H1: The increase in the scale of external financing will enhance the growth ability of new energy vehicle companies.

The new energy vehicle industry is highly technology-intensive and innovation-oriented, and its development depends on continuous technological progress and product innovation. External financing plays a crucial role in this process, providing the necessary financial support for R&D investment and accelerating the pace of technological breakthroughs and product innovation. The commercialization of innovation achievements directly promotes the market competitiveness and brand value of enterprises, thus having a profound impact on the long-term growth of enterprises and the establishment of industry status. In addition, innovation also promotes the mastery and application of new technologies by enterprises, and provides a driving force for the sustainable development of the new energy vehicle industry. Therefore, we propose hypothesis 2.

H2: The increase in the scale of external financing will promote the growth of new energy vehicle companies by improving the innovation level of enterprises.

3.2 Model Settings

According to the research hypothesis 1, this paper will construct a panel regression model to verify the hypothesis, and the benchmark regression model will be in the form of the following table:

$$Grow_{i,t} = \alpha + \beta Debt_{i,t} + \boldsymbol{\eta Control_{it}} + Province + Year + \varepsilon_{it} \quad (1)$$

Among them, $Grow_{i,t}$ are the growth variables of the enterprise, $Debt_{i,t}$ are the variables of the financing scale of the enterprise, $\boldsymbol{Control_{it}}$. are the control variables of the model, including the size of the enterprise, the asset-liability ratio, etc., $Province$ and $Year$ are the influence of the region and year in which the company is located, ε_{it} is the model residual, $\alpha, \beta, \boldsymbol{\eta}$ are the regression coefficients of the model, i represents the ith company, and t represents the year.

In order to further explore the influencing mechanism and verify the research hypothesis 2, the mediating effect model based on the benchmark model is constructed as follows:

$$Research_{i,t} = \alpha + \beta Debt_{i,t} + \boldsymbol{\eta Control_{it}} + Province + Year + \varepsilon_{it} \quad (2)$$

$$Grow_{i,t} = \alpha + \beta Debt_{i,t} + \gamma Research_{i,t} + \boldsymbol{\eta Control_{it}} + Province + Year + \varepsilon_{it} \quad (3)$$

$Research_{i,t}$ are the indicators of enterprise R&D.

Referring to the practice of Covas and Haan (2011) and Wu Huaqiang et al. (2015), this paper uses the ratio of the increase of interest-bearing debt to the total assets of the lagged period as a proxy variable for the scale of corporate debt financing, in which interest-bearing debt includes short-term borrowings, long-term borrowings and bonds payable. The growth rate of operating income is selected as the proxy indicator of enterprise growth ability. The descriptive statistics of the data are shown in Table 1, and it can be found that there are large differences in the growth ability of different enterprises, with an average of 26.74, but the minimum value is -54.29 and the maximum value is 231.08; at the same time, in terms of external financing, there is also a large gap in the same financing ability, with the maximum value of 40.21% for enterprises with strong external financing ability, but only 0.52% for enterprises with the smallest financing scale.

Table 1. Descriptive statistics of the data.

Variable	Obs	Mean	Std. Dev.	Min	Max
Grow	72	36.73712	47.75167	-54.29298	231.0813
Debt	72	0.1626281	0.0965266	0.0052196	0.4020922
Research	72	2.47E+08	3.77E+08	1.04E+07	1.79E+09
Debt-to-asset ratio	72	52.28596	18.61004	9.387785	83.82143
liquidity ratio	72	2.059866	1.465304	1.01942	10.66825

4 Empirical Results

After the Hausman test, the benchmark model should be in the form of random effects, and the model fitting results are shown in Table 2. It can be realized that the financing scale is used as an independent variable, and its coefficient is positive at the significance level of 99%, that is, the impact of financing scale on the growth of enterprises is statistically significant. Therefore, if hypothesis 1 is true, the increase in the scale of external financing of new energy vehicle enterprises has a significant positive impact on the growth of enterprises.

Table 2. Benchmark model regression results.

Grow	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]
Debt	182.5863	70.45891	2.59	0.010	44.48939 320.6832
Debt-to-asset ratio	0.261172	0.501347	0.52	0.602	-0.72145 1.243794
liquidity ratio	1.078261	6.142332	0.18	0.861	-10.9605 13.11701
_cons	-8.83323	37.66656	-0.23	0.815	-82.6583 64.99186

In order to further test hypothesis 2 and analyze the mediating effect of innovation in the impact of external financing on firm growth, the model regression results of equation (2) are shown in Tables 3 and 4, and the above models are also in the form of random effects after Hausman's test. The regression results show that when enterprise innovation is taken as the dependent variable (Table 3), the external financing scale is taken as the independent variable, and its coefficient is positive at the 99% significance level, that is, the financing scale has a significant positive impact on the R&D investment of new energy vehicle enterprises, which supports some of the views in hypothesis H2, but from the results of Table 4, when external financing and enterprise innovation are both independent variables, the coefficient of external financing is still significantly positive at the 99% significance level, but the coefficient of enterprise innovation is not significant. Not consistent with hypothesis 2. Although the direct impact of R&D investment on the growth of enterprises in the short term is not significant, the positive impact of financing scale on the growth of enterprises still exists, which may mean that the long-term effect of R&D investment has not yet appeared or requires the combined effect of other factors such as market conditions and technology transformation efficiency to significantly affect the growth of enterprises. These analysis results show that external financing plays an important role in the growth of new energy vehicle enterprises, but enterprises also need to pay attention to the long-term effect of R&D investment and market docking to achieve sustainable growth and development.

Table 3. Benchmark model regression results.

Research	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]
Debt	1.03E+09	3.06E+08	3.37	0.001	4.31E+08 1.63E+09
Debt-to-asset ratio	-1516904	1859812	-0.82	0.415	-5162069 2128261
liquidity ratio	861092.4	1.76E+07	0.05	0.961	-3.36E+07 3.53E+07
_cons	1.57E+08	1.61E+08	0.98	0.329	-1.58E+08 4.72E+08

Table 4. Benchmark model regression results.

Grow	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]
Debt	217.2652	71.87402	3.02E+00	3.00E-03	76.39469 358.1357
Research	-2.59E-08	1.70E-08	-1.52	0.128	-5.92E-08 7.43E-09
Debt-to-asset ratio	0.2593684	0.487931	5.30E-01	5.95E-01	-0.69696 1.215696
liquidity ratio	1.266154	6.077354	2.10E-01	8.35E-01	-10.64524 13.17755
_cons	-8.371808	37.02858	-0.23	0.821	-80.94648 64.20287

5 Conclusions and Recommendations

This study explores the impact of external financing on the growth of new energy vehicle enterprises through empirical analysis. The results show that external financing has a significant role in promoting the growth of new energy vehicle enterprises. Specifically, financing not only provides the necessary financial support for enterprises, but also enhances their innovation capabilities and technical strength by increasing R&D investment. However, from a short-term perspective, this improvement in R&D capabilities does not immediately translate into positive feedback on enterprise development, which may be related to factors such as the transformation cycle of R&D results, market acceptance, and internal management efficiency.

Based on the research conclusions of this paper, the following suggestions are put forward. First, new energy enterprises should strengthen the docking of R&D and the market. Enterprises should strengthen the market-oriented nature of R&D results to ensure that R&D investment can be quickly transformed into market competitiveness. Through market research and user feedback, adjust the direction of R&D and shorten the transformation cycle of R&D results. Second, enterprises need to further optimize their financing structure. When conducting external financing, enterprises should consider the diversification of financing structure and balance the ratio of debt financing

and equity financing to reduce financial risks and improve the efficiency of capital use. Third, enterprises need to improve the efficiency of internal management. Enterprises should strengthen internal management, optimize resource allocation, and improve the output efficiency of R&D investment. Through process reengineering and technological innovation, reduce costs and improve the overall operational efficiency of the enterprise. Fourth, at the macro level, the government and relevant institutions should continue to provide policy support, including tax incentives, financial subsidies, etc., to reduce the R&D costs of new energy vehicle enterprises. At the same time, strengthen the infrastructure construction of the new energy vehicle industry and improve market acceptance.

This study is limited by the number of listed companies and the nature of the company, and there are certain limitations, including the short time span of the research sample and the relatively limited geographical scope of the company.

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