



# Impact of Enterprise Size on Enterprise Investment and Its Difference in Life Cycle Stages under the Background of Big Data -- Analysis Based on Multiple Linear Regression Model of the Econometric Analysis Software STATA

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**Abstract.** Investment plays an important role in promoting the development of the country and enterprises. Enterprise size has an impact on enterprise investment, and its impact is different for enterprises in different life cycle stages. In order to investigate the impact of enterprise size on enterprise investment and its life cycle differences, this paper uses the financial data of some Shanghai and Shenzhen A-share listed manufacturing enterprises in 2018-2020 and 2017 as large sample data to establish a multiple linear regression model for empirical research. The research conclusion is that enterprise scale has a negative impact on enterprise investment, and its impact is different in life cycle stages.

**Keywords:** Big data; Multiple linear regression model; Enterprise scale; Enterprise investment; Enterprise lifecycle

## 1 Introduction

Investment plays an important role in promoting the development of the country and enterprises. In order to stimulate manufacturing enterprises to invest and guide their investment direction, the country has issued a series of preferential policies to reduce the burden of manufacturing enterprises, thus mobilizing their enthusiasm for investment. Due to the huge differences in the characteristics of enterprises in different life cycle stages, their preferred investment tendencies, investment decisions and investment behaviors are also different. Only by grasping the life cycle stages of enterprises and formulating appropriate investment strategies can we ensure the healthy development of enterprises.

In terms of the enterprise life cycle, Edith believes that a complete enterprise will go through different periods from the gestation period to the death period, that is, the development of an enterprise is a dynamic process. According to the specific analysis of the characteristics and problems of the stage in which the enterprise is located, it proposes corresponding and specific solutions [1]. In terms of the impact of enterprise

size on enterprise investment, some scholars have studied the planning model when enterprises of different sizes give consideration to investment motives [2]; Some scholars, based on overseas investment and from the perspective of enterprise scale, studied the impact of host country government behavior on Chinese enterprises' overseas investment decisions [3]; Some scholars have studied the impact of IT investment on organizational performance under the conditions of different enterprise sizes [4]; At the same time, some scholars also studied the relationship between credit scale and enterprise investment efficiency [5].

In order to explore the impact of the size of manufacturing enterprises on enterprise investment and its life cycle differences, based on big data, this paper uses the financial data of A-share listed manufacturing enterprises in Shanghai and Shenzhen Stock Exchanges from 2018 to 2020 and part of 2017 to form 3807 effective research samples, 45,696 sample observations as large sample data, and constructs a multiple linear regression model to carry out empirical research.

## 2 Theoretical analysis and research hypothesis

Enterprise scale can reflect the comprehensive strength of enterprises in the process of capital accumulation. The larger the enterprise is, the stronger its financial strength is, and the better its financial condition is, so its investment expenditure will increase; Moreover, the larger the size of the enterprise, the higher the company's operating capacity and level, the more fixed assets and intangible assets the company needs for production and operation, and the increase in investment willingness will promote additional investment for enterprises, while small-scale enterprises will do the opposite. But from another point of view, the production mode and production capacity of large and powerful enterprises have reached the peak, and there may be no strong investment demand, while the investment demand of small-scale enterprises is strong. Therefore, the correlation between the size of enterprises and their investment behavior depends on the dual game between their investment strength and investment willingness in the process of enterprise operation. Therefore, there is a correlation between the size of the enterprise and its investment expenditure, so the first hypothesis is put forwarded.

Hypothesis 1: Enterprise scale expansion will have an impact on enterprise investment.

It can be seen from the enterprise life cycle theory that the behavior characteristics of enterprises in different life cycle stages are obviously different, so the impact of their scale on enterprise investment is also different. It is necessary to classify the target research enterprises for research and discussion. This paper speculates that the size of enterprises in different life cycle stages has different effects on enterprise investment. In order to investigate the differences of their effects, this paper proposes research hypothesis 2.

Hypothesis 2: The impact of enterprise size on enterprise investment is different in life cycle stages.

### 3 Formatting the text

#### 3.1 Sample selection and data source

In this paper, the relevant financial data of A-share manufacturing listed companies in Shanghai and Shenzhen stock markets from 2018 to 2020 are taken as the research sample, and the financial data of 1269 manufacturing enterprises from 2018 to 2020 are obtained by excluding the financial data of enterprises with ST and \* ST marks that are missing from 2018 to 2020, forming 3807 effective research samples. In order to eliminate the negative impact of extreme values of variables in the data, this paper performs 1% Winsorize on the data.

#### 3.2 Variable selection

**Explained variable: enterprise investment.** Enterprise investment refers to the investment activities and behaviors of the enterprise as the main investor, which can be measured by the proportion of enterprise net investment and enterprise assets.

**Explanatory variable: enterprise scale.** When selecting indicators that can represent the scale of enterprises, this paper refers to the research practice of previous scholars [6] and takes the total assets of enterprises at the end of the current period as the natural logarithm.

**Control variables.** The control variables adopted in this paper include: accumulated depreciation, financial leverage, profitability and cash holdings.

The definitions of the interpreted variable, explanatory variable and control variable are shown in Table 1.

**Table 1.** Variable definition table.

Variable	Name	Symbol	Description
Explained variable	Enterprise investment	$in\_Invest$	(Cash paid for acquisition and construction of fixed assets, intangible assets and other long-term assets - cash recovered from disposal of fixed assets, intangible assets and other long-term assets)/total assets at the beginning of the year
Explanatory variable	Enterprise scale	Size	The natural logarithm of the total assets of the enterprise at the end of the period
control variable	Accumulated depreciation	Depre	Net fixed assets/total assets at the end of the period
	Financial leverage	Lever-Lever	Asset liability ratio
	Profitability	Roa	Return on assets ratio

Cash holdings	Cash	Closing balance of cash and cash equivalents/total assets at the end of the period
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### 3.3 Division of enterprise life cycle

See Table 2 for the types of cash flow portfolio classified by the enterprise life cycle in this paper. When determining the cash flow symbol, Li Xuhong [7]'s classification method is used for reference, and the average value of the index data in the past three years (2018~2020) is used as the measurement basis. At the present stage, China has adopted the examination and approval system for enterprises to be listed and issued shares, which puts forward higher requirements for the capital strength of enterprises to be listed. Therefore, this paper believes that listed companies are almost not in the initial stage. In order to ensure the rationality of the division, it studies the merger of enterprises in the initial stage and the growth stage of the traditional life cycle.

**Table 2.** Types of cash flow portfolio divided by enterprise life cycle.

	Cash flow from operating activities	Cash flow from investing activities	Cash flow from financing activities
Initial stage	-	-	+
Growth period	+	-	+
Mature period	+	-	-
	-	-	-
	+	+	+
	+	+	-
	-	+	+
	-	+	-

### 3.4 Model building

In order to explore the impact of enterprise size on enterprise investment, this paper constructs a model as follows to verify hypothesis 1.

$$Invest = \alpha_0 + \alpha_1 Size + \alpha_2 Depre + \alpha_3 Lever + \alpha_4 Roa + \alpha_5 Cash + \varepsilon \quad (1)$$

Wherein, the coefficient of enterprise size  $\alpha_1$  is used to measure the direction and degree of influence of enterprise size on enterprise investment. If the coefficient  $\alpha_1$  of enterprise size is not equal to 0 and significant, then hypothesis 1 is valid.

In order to explore the differences in the impact of enterprise size on enterprise investment in different life cycle stages, data tests are conducted on sub-samples divided into life cycle stages, so as to verify hypothesis 2.

## 4 Empirical research

### 4.1 Descriptive statistics

After removing the outliers and missing values, a total of 3807 valid research samples were selected from 1269 listed companies in the three years from 2018 to 2020. Descriptive statistics of all sample data were carried out through the econometric analysis software stata15.1. The statistical results are shown in Table 3.

**Table 3.** Descriptive Statistics of Variables.

Variable	Number of samples	Mean value	Standard deviation	Minimum value	Maximum value
Invest	3807	0.0602	0.0583	-0.0135	0.3036
Size	3807	22.3237	1.2031	20.1642	25.9958
Depre	3807	0.2210	0.1239	0.0278	0.5965
Lever	3807	0.3841	0.1672	0.0741	0.7607
Roa	3807	0.0913	0.0772	-0.2286	0.3144
Cash	3807	0.1466	0.0980	0.0164	0.4927

The average corporate investment expenditure of listed companies in China from 2018 to 2020 is 6.02%, and the standard deviation is 5.83%, indicating that there is a large difference in corporate investment expenditure between listed companies. From the perspective of enterprise size, the average enterprise size of listed companies in China from 2018 to 2020 is 22.32%.

### 4.2 Regression result analysis

Sections should be numbered with a dot following the number and then separated by a single space:

In order to explore the impact of enterprise size on enterprise investment behavior, and test hypothesis 1, this paper uses the financial data of 1269 A-share manufacturing listed companies in Shanghai and Shenzhen stock markets as big data research samples to conduct a multiple linear regression analysis of enterprise size on enterprise investment. As shown in Table 4, the impact coefficient of enterprise scale on enterprise investment is -0.0063. It can be seen that the enterprise scale has a very significant negative impact on enterprise investment at the significance level of 1%, indicating that the larger the enterprise is, the lower its investment intention is. The smaller the enterprise is, the stronger its investment intention is for the continued development of the enterprise. The empirical research results are consistent with the results of the previous theoretical analysis, so Hypothesis 1 can be verified.

**Table 4.** Regression Results Analysis of the Impact of Full sample Enterprise Size on Enterprise Investment.

Variable name	coefficient	T value	standard deviation	VIF
Size	-0.0063***	-7.08	0.0009	1.43
Depre	0.1138***	15.01	0.0076	1.10
Lever	0.0424***	6.47	0.0066	1.51
Roa	0.1865***	15.40	0.0121	1.08
Cash	-0.0060*	-1.81	0.0101	1.23
N	3807			
R <sup>2</sup>	0.1090			
Adj R <sup>2</sup>	0.1078			
F	92.93***			
Probe>F	0.0000			

Control variables also have a significant impact on enterprise investment. First, accumulated depreciation has a significant positive impact on enterprise investment. Second, financial leverage and corporate investment have a significant positive impact on corporate investment. Third, the return on assets is positively correlated with enterprise investment. Fourth, cash holdings have a positive correlation with corporate investment.

**Table 5.** Regression analysis table of the impact of enterprise size on investment by sub-sample of life cycle stage.

	Growth period	Mature period	Recession period
Size	-0.0015 (-0.90)	-0.0043*** (-4.83)	0.0047** (2.06)
Depre	0.1767*** (11.86)	0.0735*** (10.60)	0.0446*** (2.60)
Lever	0.0251** (2.01)	-0.0171*** (-2.56)	0.0051 (0.29)
Roa	0.2316*** (11.01)	0.1573*** (12.74)	0.0297 (0.85)
Cash	-0.0187 (-0.89)	0.1159*** (5.98)	-0.0210 (-0.74)
N	1683	1719	405
R <sup>2</sup>	0.1451	0.1372	0.0468
Adj R <sup>2</sup>	0.1425	0.1352	0.0349
F	56.92***	68.16***	3.92***

Based on the above analysis, the impact of enterprise size on enterprise investment under different life cycle perspectives is different in life cycle stages, and research

hypothesis 2 is verified. As shown in Table 5, from the perspective of impact direction, enterprise size has a negative impact on enterprises in the growth and maturity life cycle stages, while it has a positive role in promoting enterprise investment in the recession; From the significance level and t value of the impact, it can be seen that the impact of enterprise size on mature enterprises, declining enterprises and growing enterprises is decreasing.

## 5 Research conclusions and relevant suggestions

Through empirical research on the financial data of 1269 A-share manufacturing listed companies in Shanghai and Shenzhen Stock Exchanges from 2018 to 2020 and part of 2017 as big data research samples, two research conclusions are drawn. First, enterprise size has a negative impact on enterprise investment. Secondly, its impact is different in life cycle stages: from the perspective of impact direction, enterprise size has a negative impact on enterprises in growth and maturity life cycle stages, while it has a positive role in promoting enterprise investment in recession; From the significance level, the influence of enterprise size in the mature period on enterprise investment is the most significant, followed by enterprises in the recession, while the influence of enterprise size on enterprise investment in the growth period is not significant.

Two suggestions are put forward on the conclusion of this study. First, implement preferential policies to further support the development of start-up and growth enterprises. Second, guide mature enterprises to optimize investment.

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