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Empirical Study on the Growth Model and the Division of Lifecycle Phases about the Chinese Construction Industry

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Abstract: The construction industry plays a fundamental and pillared role in the national economy. Since the reform and opening-up, great contribution has been made to the modernization and urbanization by construction industry. This paper collected statistics data from 1989 to 2012, analyzing the history, the present situation and the future trend of the development of national construction industry by using the Logistic growth model and the Gompertz curve model. The results showed that the actual data of the national construction industry were in good agreement with the two models. The average annual growth rate of the gross product was 16.88% (according to the constant prices in 1989). However, it has entered into the mature phase of the industry life cycle now. Although the gross product will continuously grow over a period of time in the future, but the extent of increase is gradually taking slow (The inflection point T is in August 2011). Faced with the existed problems of relatively saturated capacity, low-level quality, insufficient awareness of ecological energy-saving, low technical efficiency, little contributions of science and technology, this paper suggests that the government should further deepen the Reform of the system, optimize the industrial structure and standardize the market order. And the enterprises should strengthen the capacity of the capital operation, upgrade the level of the management and technology and enhance their core competitiveness. Through these measures, the national construction industry can be prevented from falling into recession too fast and keep its maturity and stability, promoting the transformation of construction industry from the "extensive" development mode to "intensive" mode.

Keywords: construction industry, growth curve, industrial life cycle.

INTRODUCTION

Industry life cycle theory which is developed and evolved from the product life cycle theory has been widely used to recognize industry life cycle and forecast the future development trend. So far, there are few researches on the development status of construction industry from the perspective of the industry life cycle. If the construction industry continues to obtain good economic benefit, its current life cycle stage must be recognized accurately as far as possible, and its future development trend also needs to be forecasted. And then, basing on the recognition and the prediction, the government can formulate and implement the appropriate strategic management policy to promote its healthy, rapid and sustainable development. This study recognizes and analyzes the national construction industry life cycle from the perspective of the industry life cycle theory by using the growth curve measurement models. It puts forward some suggestions which can keep the output value of the national construction industry steady increasing and accelerate the development of the national construction industry.

LITERATURE REVIEW

Construction industry is a manufacturing industry, which is specialized in civil engineering, housing construction, equipment installation and engineering survey and design, etc. It is an important industrial department of the national economy. Its healthy development is related to the progress of the national economy, while it also has close contact with the improvement of the people's living standards. With the national fixed asset investment rate increased year by year, the gross product of construction industry accounted for the GDP has increased from 9.65% in 1994 to 26.41% in 2012. And the average annual growth rate of the total pre-tax profits is up to 24.69% [1]. The growth of the construction output value is limited or not, its development is followed by certain or not, these problems will affect the management decisions of government and enterprises. Several scholars had made deep research on the present situation and future trend of the development of construction industry.

Researches on the present situation of construction industry development had been concentrated on these aspects as follows: firstly, describing the developing situation of industry through comprehensive statistical analysis of the construction industry output value and its added value of output [2, 3]; Secondly, prospecting the road to reform of national construction industry by comparing with the developmental level of construction industry in developed countries [4]; Thirdly, clarifying the differences between national regional construction industry from the point of competitive capability [5]. Fourthly, making quantitative analysis of construction industry's developmental situation in the aspects of productivity efficiency and production factors [6, 7]. Although the former researches were from different perspective and

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used various research approaches, the issue applying industrial life cycle theory was still rare in study on life cycle of construction industry. The life cycle concept in biology is the whole process from birth to death. It is an experience of an organism that has living characteristics. This concept was used to describe the development cycle of one product when it was first introduced to economics and management. Its application was expanded to one enterprise or one industry in afterwards [8]. From the life cycle theory of product in the 1960s, to the G-K industry life cycle theory in the 1980s, to the K-G industry life cycle theory in the 1990s, this theory was gradually mature after the conflict and fusion from every branch [9, 10]. Based on the construction industry life cycle theory, this paper recognizes and analyzes the history of development, the current situation and the future trend about the national construction industry life cycle by using the Logistic growth model and the Gompertz curve model.

ANALYSIS MODEL ASSUMPTION AND ESTABLISHMENT

The industry life cycle theory originated in the 1980s, it was one of the important theoretical bases for modern industry histology empirical analysis. It was formed on the basis of developing and evolving of the product life cycle theory which was put forward by Vernon in 1966. The industry life cycle theory refers to the periods from the appearance of industry to the completely exit of the social economic activities. Product life cycle theory is a kind of qualitative theory which describes the development of a product by using the approximate assumption curve. It ignores the specific differences between the product types, the quality, the specifications, etc. Only from the perspective of the whole industry, it divides the life cycle into 4 periods: the introduction stage, the growth stage, the maturing stage and the recession stage. The maturing stage is further divided into the early maturing period and the late maturing period. Almost every industry growth curve presents an approximate S shape before the early maturing period. For the late maturing period, there are two main forms: in one form, the industry is in the maturing stage for a long time and becomes a stable industry. In the other form, the industry enters in the recession stage rapidly and becomes a quickly recessionary industry. At present, this theory and curve is mainly used in the empirical research like dividing the stage of the industry, analyzing the specific phase, demonstrating the existence of the curve, comparing different curves, making strategic plans, etc. The industry life cycle curve is usually described by a growth curve. According to the descriptive features of the curve, the growth curve models are roughly divided into three types: the first type is a curve model which describes the diminishing returns, such as the exponential function curve; the second type is a smooth S type curve model which describes only a fixed point, such as the Logistic curve and the Gompertz curve; the third type is a smooth S type curve model which describes some variable inflection points, such as the Bertalanffy curve and the Richards curve [11]. This paper selected the Logistic curve and the Gompertz curve to study the life cycle of the national construction industry in China.

At present, the Logistic growth model and the Gompertz curve model has been widely used in fitting and predicting the life cycle curve in the field of the natural, the social statistics and the econometrics. The origin of these two models can be traced to the exponential growth model. They are the results of amending the growth rate in the exponential growth model. Their growth rates increase firstly and then decrease. It makes the whole curve shows a characteristic like S-types. This characteristic is extremely consistent with the characteristics of the industry life cycle and the product life cycle in the field of econometrics. Therefore, they are often used in fitting and forecasting the life cycle of an industry or a product in recent years.

The equation of the Logistic growth model:

$$\hat{y} = K \Big/ \left\{1 + B \cdot \exp\left[-A \cdot \left(x - x_0\right)\right]\right\} \tag{1}$$

The equation of the Gompertz curve model:

$$\hat{y} = K \cdot \exp\left\{-B \cdot \exp\left[-A \cdot \left(x - x_0\right)\right]\right\} \tag{2}$$

In the calculation formula of the two models above: $\hat{y}$ is the dependent variable; x is the independent variable; the parameter x_0 is the independent variable initial value; the Parameter K is the limit value or saturation value; the parameters A is a growth factor, it decides the slope of curve for the middle section; the parameter B is a constant scale factor, it decides the position of the curve.

For: $A = -\ln b_1 = -\ln a$, $B = C \cdot K = -\ln b$, the equations of the two models can be rewritten as the following forms:

The first form:

$$\begin{cases} \text{Logistic: } \hat{y} = K \Big/ \left(1 + C \cdot K \cdot b_1^{x-x_0}\right) \\ \text{Gompertz: } \hat{y} = K \cdot \exp\left[-C \cdot K \cdot b_1^{x-x_0}\right] \end{cases} \tag{3}$$

The second form:

$$\begin{cases} \text{Logistic: } \hat{y} = K \Big/ \left(1 - \ln b \cdot a^{x-x_0}\right) \\ \text{Gompertz: } \hat{y} = K \cdot b^{a^{x-x_0}} \end{cases} \tag{4}$$

Two regression equations of the two models from the first form:

$$\begin{cases} \text{Logistic: } \ln\left(1/\hat{y} - 1/K\right) = \ln C + \left(x - x_0\right) \cdot \ln b_1 \\ \text{Gompertz: } \left(\ln K - \ln \hat{y}\right) \Big/ K = C \cdot b_1^{x-x_0} \end{cases} \tag{5}$$

The parameters (K, C and b_1) can be calculated by using the mathematical statistical analysis software to fit the data. And then, the equations of the two curves can be got after substituting these parameters into formula (3). Similarly, the parameters (K, C and b_1) also can be calculated by using the Three Parts Summation Method on the basis of the second form. The equations of the two curves also can be got after substituting these parameters into formula (4).

ORIGINAL DATA PROCESSING

This paper collected the statistic data of Chinese gross product of construction industry from 1989 to 2012. Gross product of construction industry refers to the sum in monetary terms of construction products and services completed by construction enterprises during a given period of time. It includes: (1) Output value of construction projects, which is the value of various projects covered by the project budgets; (2) Output value of equipment installation projects refers to the value of the installation of equipment. It does not include the value of the equipment itself. (3) Other output values, which are output values other than output value of construction projects and output value of installation projects, including output value of house and building repair, output value of non-standard equipment manufacture, management expenses received by overall contractor enterprises from subcontractor enterprises and output value completed in unclassified construction activities. Considering the influence of the factors (such as inflation, price changes) to the indexes in different years and enhancing the accuracy and the comparability of the data, the selected data were discounted to 1989 according to the price index for investment in fixed assets. Price index for investment in fixed assets reflects the trend and degree of changes in prices of investment in fixed assets in various projects and in the whole country. It can be used to remove the factor of price changes in the data of investment in fixed assets calculated at current prices, to truly reflect the scale, growth rate, structure, proportion and efficiency of investment in fixed assets in various projects and in the whole country, and to provide a scientific and reliable basis for formulating the plan for investment in fixed assets and examining its fulfillment as well as for conducting national economic accounting. All basic data derived from China Statistical Yearbook [12]. The details are shown in the Table **1**.

CALCULATION AND ANALYSIS

Logistic Curvilinear Regression

A Logistic curve regression estimate about national gross product of construction industry from 1989 to 2012 had been done by using the mathematical statistics analysis software. The evaluation indexes of the model and the OLS estimates of the parameters had been got. The details are shown in the Table **2**.

Logistic regression equation:

$$\hat{y} = K \Big/ \left[1 + \left(9.384\text{E-}04\right) \cdot K \cdot 0.849^{x-1989}\right] \tag{6}$$

Among the above-mentioned equation: $K \to +\infty$

Actual regression equation:

$$\hat{y} = 1 \Big/ \left[0 + \left(9.384\text{E-}04\right) \times 0.849^{x-1989}\right] \tag{7}$$

Goodness-of-fit R^2=0.996 reflects that the linear regression model which is composed of the independent x and the dependent $\hat{y}$ has a very high degree of adaption. According to the degree of freedom: df_1=1 and df_2=22, If the á=0.001 is taken, the result of $F_{0.999}(1,22)$=14.38 will be got. Obviously, there is a result of F test value: $5684.270 > 14.38$. It indicates that the regression equation is significant under the significant level of 0.001. Meanwhile, Sig.=0.000<0.05 has also passed the test. In summary, this equation is the approximate quantitative relation between the gross product of construction industry $\hat{y}$ and the time x.

Through the above approximate quantitative equation between the gross product of construction industry $\hat{y}$ and the time x, the regression values of the 1989-2012 can be calculated. And then, the relative residual rates can be got by contrasting the observed values with the regression values. The details are shown in the Table **3**. According to the Table **3**, the logistic growth curve of Chinese construction industry life cycle from 1989 to 2012 is drawn. The details are shown in the Fig. (**1**).

From the Table **3**, the observed values are relatively close to the regression values from 1989 to 2012. In each year, the relative residual rates are mainly controlled within ±10.00%. The overall average residual rate is 4.88%(<5.00%). It belongs to the second-order accuracy (well). In addition, the first-order derivative and the second-order derivative of the regression equation (7) are as follows:

$$\hat{y}' = 174.408 \times 0.849^{1989-x} \tag{8}$$

$$\hat{y}'' = 28.545 \times 0.849^{1989-x} \tag{9}$$

In the case of $x \geq 1989$, there are $\hat{y}' > 0$ and $\hat{y}'' > 0$. It shows that the general development of national construction industry has presented a rapid growth trend, and its growth rate also has been increased. Combined the rising and concave-down features of the curve depicted in the Fig. (**1**), it further instructs that national construction industry has entered the growth stage or the early maturing period of the life cycle. According to the industry life cycle theory, the growth rate of industry maintains a steady growth trend in the growth stage (the curve is concave-down). But when it enters in the early maturing period, the growth rate is slowing down (the curve is concave-up). Therefore, there must be a symbolic time-point which is used to distinguish between the growth stage and the early maturing period in the life cycle. This symbolic time-point is the inflection point T in the growth curve equation, i.e., the point is $\hat{y}'' = 0$. The coordinates of the inflection point T in the Logistic growth curve equation formula (3) is $\left(x_0 - {}^{\ln(C\cdot K)}\!/_{\ln b_1}, {}^{K}\!/_{2}\right)$. In the results of the Logistic curvilinear regression about national construction industry from 1989 to 2012, there is a outcome: $K \to +\infty$. It causes that the abscissa of the inflection point T tends to the infinity, i.e., the curve does not have a inflection point. And then, it is not sure whether the development of national construction industry is in the growth stage or in the early maturing period at present. Therefore, the basic data should be identifying and screening, a more appropriate measurement model of the growth curve should also be chosen at the same time. The life cycle of national construction industry needs to be further researched.

Gompertz Curvilinear Regression

For the data array with lager year span, the early data shows a waning influence to the development trend of the data in the late. At the same time, after tentatively estimating the basic data in different span of years, it can be found that the data from 2007 to 2012 are adapted well to the growth curve of the construction industry life cycle. Thus, this portion of the data are selected and discounted to 2007 according to the price index for investment in fixed assets. Then this paper did a regression estimate on national construction industry by using the Gompertz curvilinear model. The evaluation indexes of the model and the OLS estimates of the parameters had been got. The details are shown in the Table **4**.

Table 1. Statistics of the gross output value of construction.

Year	Gross Output Value of Construction (hundred million Yuan)	Price Index for Investment in Fixed Assets (last year=100)	Comparable Prices of the Gross Output (hundred million Yuan)	
			Conversion to 1989	Conversion to 2007
1989	1282.98	100.00	1282.98	——
1990	1345.01	108.00	1245.38	——
1991	1564.33	109.50	1322.79	——
1992	2174.44	115.30	1594.70	——
1993	3253.50	126.60	1884.73	——
1994	4653.32	110.40	2441.70	——
1995	5793.75	105.90	2870.74	——
1996	8282.25	104.00	3945.93	——
1997	9126.48	101.70	4275.46	——
1998	10061.99	99.80	4723.17	——
1999	11152.86	99.60	5256.25	——
2000	12497.60	101.10	5825.93	——
2001	15361.56	100.40	7132.48	——
2002	18527.18	100.20	8585.13	——
2003	23083.87	102.20	10466.34	——
2004	29021.45	105.60	12460.68	——
2005	34552.10	101.60	14601.69	——
2006	41557.16	101.50	17302.49	——
2007	51043.71	103.90	20454.53	51043.71
2008	62036.81	108.90	22828.05	56966.77
2009	76807.74	97.60	28958.40	72264.88
2010	96031.13	103.60	34947.96	87211.67
2011	116463.32	106.60	39759.57	99218.92
2012	137217.86	101.10	46335.31	115628.48

Table 2. Logistic model summary and parameter estimates.

Dependent Variable: $\hat{y}$

Equation	Model Summary					Parameter Estimates	
	R^2	F	df_1	df_2	Sig.	C	b_1
Logistic	0.996	5684.270	1	22	0.000	9.384E-04	0.849

The independent variable is x, and the original value is $x_0 = 1989$.

By using the Three Parts Summation Method, the parameters of the regression equation are as follows: $K = 299498.40 = 2.995\text{E+}05$, $a = 8.800\text{E-}01$ and $b = 1.614\text{E-}01$. Furthermore, $C = 6.090\text{E-}06$ and $b_1 = 0.880$ can be got.

Gompertz regression equation:

$$\hat{y} = \left(2.995\text{E+}05\right) \times 0.161^{0.880^{x-2007}} \tag{10}$$

Goodness-of-fit R^2=0.988 reflects that the linear regression model which is composed of the independent x and the dependent $\hat{y}$ has a very high degree of adaption. According to the degree of freedom: df_1=1 and df_2=4 ,

Table 3. Logistic regression results and relative residual rate.

Year	Observed Value (hundred million Yuan)	Regression Value (hundred million Yuan)	Relative Residual Rate(%)	Year	Observed Value (hundred million Yuan)	Regression Value (hundred million Yuan)	Relative Residual Rate(%)
1989	1282.98	1065.61	16.94	2001	7132.48	7595.72	-6.49
1990	1245.38	1255.10	-0.78	2002	8585.13	8946.43	-4.21
1991	1322.79	1478.29	-11.76	2003	10466.34	10537.33	-0.68
1992	1594.70	1741.17	-9.18	2004	12460.68	12411.13	0.40
1993	1884.73	2050.79	-8.81	2005	14601.69	14618.15	-0.11
1994	2441.70	2415.47	1.07	2006	17302.49	17217.62	0.49
1995	2870.74	2845.01	0.90	2007	20454.53	20279.35	0.86
1996	3945.93	3350.92	15.08	2008	22828.05	23885.54	-4.63
1997	4275.46	3946.80	7.69	2009	28958.40	28132.99	2.85
1998	4723.17	4648.64	1.58	2010	34947.96	33135.75	5.19
1999	5256.25	5475.29	-4.17	2011	39759.57	39028.13	1.84
2000	5825.93	6448.93	-10.69	2012	46335.31	45968.32	0.79

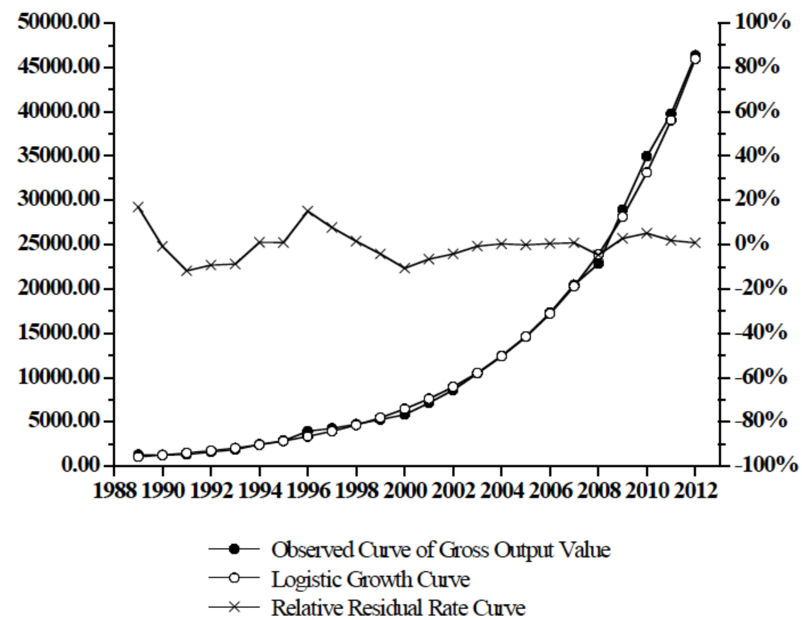

Fig. (1). Construction industry life cycle in 1989-2012.

Table 4. Gompertz model summary and parameter estimates.

Dependent Variable: $\hat{y}$

Equation	Model Summary					Parameter Estimates	
	R^2	F	Df_1	df_2	Sig.	C	b_1
Gompertz	0.988	316.235	1	4	0.000	6.090E-06	0.880

The independent variable is x, and the original value is $x_0 = 2007$.

Table 5. Gompertz regression results and relative residual rate.

Year	Observed Value (hundred million Yuan)	Regression Value (hundred million Yuan)	Relative Residual Rate(%)	Year	Observed Value (hundred million Yuan)	Regression Value (hundred million Yuan)	Relative Residual Rate(%)
2007	51043.71	51043.71	5.31	2010	87211.67	87211.67	0.92
2008	56966.77	56966.77	-5.60	2011	99218.92	99218.92	-1.10
2009	72264.88	72263.88	-0.93	2012	115628.48	115628.48	1.08

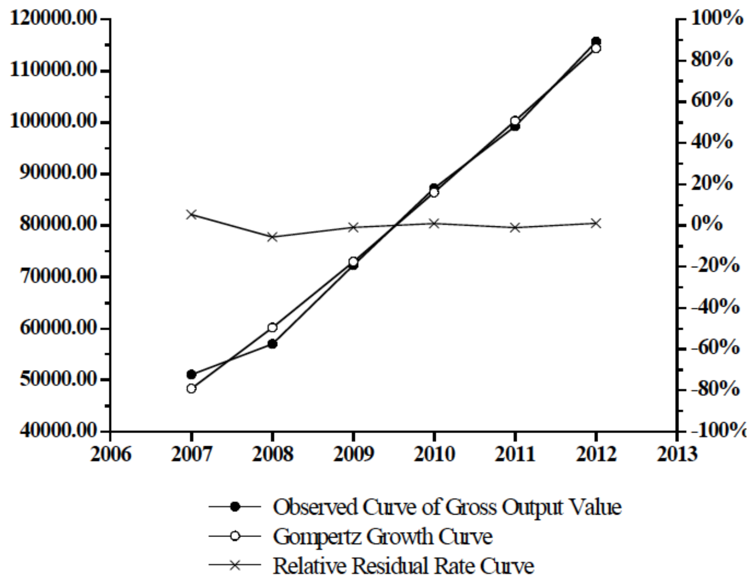

Fig. (2). Construction industry life cycle in 2007-2012.

If the á=0.001 is taken, the result of $F_{0.999}(1,4)$=74.14 will be got. Obviously, there is a result of F test value: $316.235 > 74.14$. It indicates that the regression equation is significant under the significant level of 0.001. Meanwhile, Sig.=$0.000 < 0.05$ has also passed the test. In summary, this equation is the approximate quantitative relation between the gross product of construction industry $\hat{y}$ and the time x.

Through the above approximate quantitative equation between the gross product of construction industry $\hat{y}$ and the time x, the regression values of the 2007-2012 can be calculated. And then, the relative residual rates can be got by contrasting the observed values with the regression values. The details are shown in the Table **5**. According to the Table **5**, the Gompertz growth curve of Chinese construction industry life cycle from 2007 to 2012 is drawn. The details are shown in the Fig. (**2**).

From the Table **5**, the observed values are more close to the regression values from 2007 to 2012. In each year, the relative residual rates are mainly controlled within $\pm 6.00\%$. The overall average residual rate is 4.31%(<5.00%). It belongs to the second-order accuracy (well). In addition, the first-order derivative and the second-order derivative of the regression equation (10) are as follows:

$$\hat{y}' = \left(6.982\text{E+04}\right) \times 0.880^{x-2007} \times 0.161^{0.880^{x-2007}} \quad (11)$$

$$\hat{y}'' = \left(\text{-8.925E+03}\right) \times 0.880^{x-2007} \times 0.161^{0.880^{x-2007}} \times \left(1 - 1.824 \times 0.880^{x-2007}\right) \quad (12)$$

In the case of $x \geq 1989$, there is $\hat{y}' > 0$. It also shows that the general development of national construction industry has presented a rapid growth trend. Meanwhile, combined with the result of the Logistic regression analysis, it can be sure that the period from 2007 to 2012 is the growth stage or the early maturing period. For the Gompertz growth curve, the point of $\hat{y}'' = 0$ is also the symbolic time-point which is used to distinguish between the growth stage and the early maturing period, i.e., the inflection point T. The coordinates of the inflection point T in the Gompertz growth curve equation formula (4) is

$$\left(x_0 + {\ln\left[-(\ln b)^{-1}\right]} \big/ {\ln a}, \; K \big/ e \right).$$

Through substituting the parameters into the calculation formula of the coordinates or assuming that the second-order derivative of the regression equation is zero, the inflection point T of the Gompertz curve can be obtained. Its coordinates are $\left(2011.70, 110179.30\right)$. In the case of $2007 \leq x < 2011.70$, there are $\hat{y}' > 0$ and $\hat{y}'' > 0$. In the case of $2011.70 < x < t_S$, there are $\hat{y}' > 0$ and $\hat{y}'' < 0$. It indicates that the periods from 2007 to Aug. 2011 is the growth stage of the construction industry life cycle. During these periods, the gross product kept a sustained growth, and its growth rate also has been increased. The growth rate of the gross product peaked in Aug. 2011. After the Aug. 2011, national construction industry entered in the early maturing period. The gross product still kept a sustained growth, but its growth rate had been decreased.

FOUND PROBLEMS AND COUNTERMEASURES

The development of any industry has its own trajectory. It follows a definite life cycle curve in the process of its origin, growth, maturity and decline. Construction industry as a traditional industry is no exception. According to the research results of the Logistic growth model and the Gompertz curve model, an S-type growth curve which described Chinese construction industry life cycle had been drawn. The details are shown in the Fig. (**3**).

Basing on referencing the former Soviet Union's model of highly planned economy, Chinese construction industry adopted the planned economy mode to assign the construction mission, to appropriate the construction funds, to supply the building materials and the mechanical equipment from the early statehood to 1978. Although certain achievements had been made, the overall level of development was still fall behind the foreign developed countries. In 1984, the national construction industry started the whole industry reform in the city. Its development pattern began to transform from to a mixed model which took the public ownership economy as the main body and combined with the different ownership economy. By 1997 or so, the industry strength had shown a definite improvement along with the implementation of the reform. These two periods can be identified as the introduction stage of the Chinese construction industry life cycle.

Since our country joined the WTO in 1997, the changes of the international and the domestic market situations had brought unprecedented opportunities and challenges for the development of the construction industry. Some large state-owned construction enterprises started to go abroad gradually and made full use of the demand of the international construction market to gain benefits and opportunities for their own developments. The preliminary achievements of the domestic reform and opening up had gradually accumulated. The subsequent reforms were also continuously deepened. These made the demand of the social fixed asset investment increase year by year. Thus, the domestic building process was further accelerated. The demand of the international and the domestic environment made the national construction level get fully development and improvement in these 15 years. During this period, Chinese construction industry was in the growth stage of the industry life cycle.

In the second half of 2011, the growth rate of the gross product achieved the peak value. It marked that the construction industry reached the inflection point T of the life cycle. After a new round golden development period which was about 15 years, the speed of the construction industry development would slow gradually. So far, Chinese construction industry had entered into the early maturing period of the industry life cycle. The growth rate of the gross product would experience a period of decline in the future. However, the construction industry still maintained a strong growth in the next following period.

After nearly half a century development, Chinese construction industry has entered into the early maturing period of the industry life cycle. The development of the construction industry drives the development of other departments in the national economy. It creates a lot of jobs for society and alleviates the employment pressure in our country. The going-out strategy has started to produce results. Many domestic enterprises have got great achievement in the international project contracting, the labor cooperation, the design consulting, etc. In recent years, Chinese construction industry has completed a huge number of building missions which have advanced technology, complicated craft and large scale. In these missions, the technical level and quality level of some projects have reached or even exceed the international advanced level. This marks that the engineering construction in our country is making efforts to strive toward the advanced construction level of the world. Meanwhile, the in-

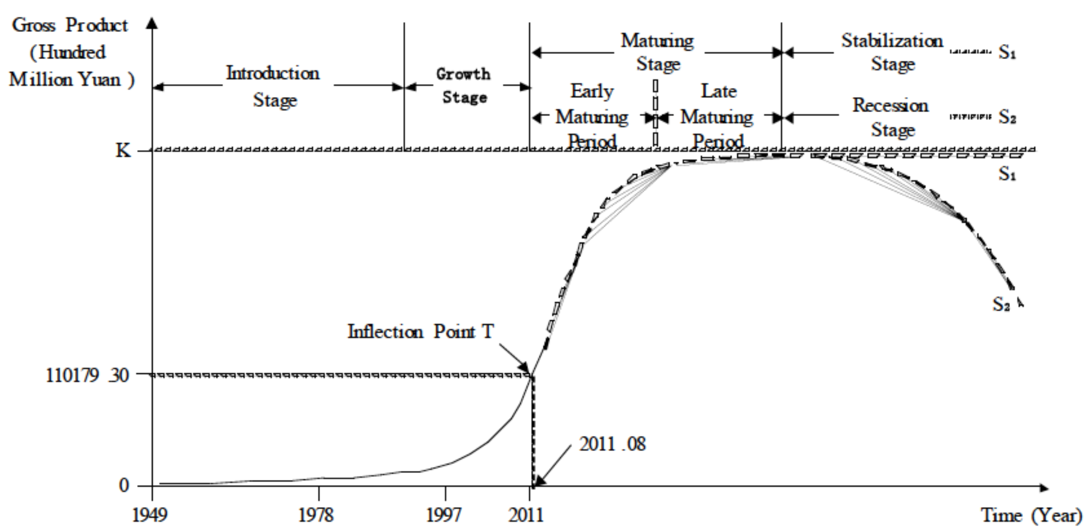

Fig. (3). Growth curve of national construction industry life cycle.

dustrial organization structure of the construction industry has been constantly optimized. The single configuration mode of the resources has been broken. The ownership structures have tended to the diversification. In addition, the laws and regulations system of the construction engineering has been basically established. The operation rules and management system has been established effectively. A Competitive, transparent and open market operation order has preliminarily formed. However, the phenomena of the excess capacity, low efficiency and low technology still exist in the process of development for a long time. These problems seriously affect the international competitiveness and the social economy driving force of Chinese construction industry. At macro level, the gross product of Chinese construction industry increases year by year, but the profit margin of the gross product is keeping falling. It means that the increase of the gross product mainly depended on the building needs which result from the increase of the total social fixed asset investment, not gained by improving the management level, technological content and labor productivity. At present, the competition of the construction market has become increasingly fierce. The requirement of the high level and intelligent building is higher and higher. Finally, these factors lead a result that the growth rate of the gross product entered into the declining period in the second half of 2011. According to the development situation of the current construction industry and combining with the two forms of the later maturing period in the industry life cycle theory, some measurements should be taken to prevent the construction industry rapidly falling into the recession stage in the future, and keep it staying in the maturing stage in the long-term to form a stable industry. The government should increase the economic income level of the construction industry, further standardize the construction market order, intensify the reforms of the construction management system, and deepen the optimization of the construction industrial structure. The construction enterprises should make efforts to explore their own capital operation ability, enhance the level of the management and technology, and strengthen the market core competitiveness.

Through these methods, the development patterns of the whole construction industry will transform from the extensive form to intensive form as soon as possible.

CONCLUSION

This paper describes the growth curve of the construction industry development in our country by using the industry life cycle theory. It is mastered the development history, the current status and the future trend of the construction industry. At the same time, according to the fact that the construction industry is currently in the early maturing stage of the industry life cycle, the present situation is analyzed. Some suggestions which are used to keep the construction industry stay in the maturing stage for a long time in the future are put forward. The selection of the growth curve equation directly determines the result of the life cycle analysis. Therefore, the choice and prove of the growth curve may still needs to be improved and perfected.

CONFLICT OF INTEREST

The authors confirm that this article content has no conflict of interest.

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