



Research Article

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Analysis on the gray correlation to China's economic growth path of the foreign direct investment

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ABSTRACT

The total factor productivity is selected as the index of economic china's economic growth path. The determination and calculation of the index of capital stock and factor input urge to estimate the contribution value from total factor productivity to economic in 1983-2012. Grey Relational Analysis is used, and MATLAB programming is used in the realization process. It proved that the gray correlation exists between foreign direct investment and china's economic growth path.

Key words: foreign direct investment; total factor productivity; Grey Relational Analysis

INTRODUCTION

Since liberalization in 1978, it makes nearly important that foreign direct investment has contributed enormously to china's economic progress, and foreign direct investment is not just funds transfer between country and country, but multi-faceted "comprehensive transfer" including sales skills, development cooperation, exchange of technology, knowledge management, resource development and other elements. Whether does foreign direct investment impact on the transforms to economy growth in China or not? Whether there is a relationship between the two or not? This paper proves mainly by gray relational analysis. By the availability of data, influence research is analyzed detailedly on that foreign direct investment has contributed to transforms of economy growth by the selected variables, model building and empirical analysis.

2. VARIABLE SELECTION, DATA SOURCE, MODEL BUILDING

Sources of TFP including technological progress, organizational innovation, professionalism and building innovation and so on. The part that output growth rate exceeds the factor input growth rate is TFP growth rate. The contribution which TFP drives to economic growth plays important role in transforms of economy growth. Thus, the contribution values of total factor productivity as the index of economic growth mode is desirable. Due to the availability of data, this paper will select total factor productivity as the index of Chinese economic growth mode between 1983 and 2012. The calculation of the contribution values of total factor productivity below will be described.

In addition, the foreign direct investment index is relatively simple. Most of the literatures are use of actual foreign capital utilization of foreign direct investment as a measure index. The data is from China statistical yearbook. In order to facilitate the estimation, the annual exchange rate is used to equivalent \$ to 100 million yuan. In this paper, using Solow residual method is used to estimate the total factor productivity. Mainly according to the following formula:

$$\frac{\Delta A_t / A_t}{\Delta Q_t / Q_t} + \alpha \frac{\Delta L_t / L_t}{\Delta Q_t / Q_t} + \beta \frac{\Delta K_t / K_t}{\Delta Q_t / Q_t} = 1 \quad (1)$$

Among them, QT represents the total factor productivity, AT represents total factor productivity, Lt, Kt says the labor and capital function, α and β respectively represent labor and capital output elasticity. The two most important elements are capital inputs calculation and element Input index determination. The capital inputs calculation uses Perpetual inventory method. That is to say: capital inputs in year before last +the gross capital formation- the depreciation of capital=The capital stock. The formula is as follows.

$$K_t = (1 - \delta) * K_{t-1} + I_t / P_t \quad (2)$$

Among them, Kt shows capital stock during the period of t, δ shows capital depreciation rate, Kt-1 shows survivor capital stock the last year of t. It shows investment (in current prices) during the period of T; Pt refers to price index. Of the T period. The key of estimating the capital stock is: The base capital stock K0, the choice of investment flow index, selecting the price index and the rate of depreciation is confirmed. This paper refers to the literature from Guo Qingwang, Jia Junxue as calculating the period capital stock index. The fixed assets investment are Selected as a measure index of the investment flow. The price index is relative to the investment flow, The fixed assets price number is selected as the index. The rate of depreciation has no fixed solution scheme at the moment. This paper will use the most common depreciation rate value of 5%. And the capital stock in 1978 is used as the base period. Since the capital stock in 1978 and 1990 is used as the base period according to the most literatures. And the data time span from 1982 to 1978. For the convenience of using the data of 1978 as the base period. The data sources include China statistical yearbook, the network database, the National Bureau of statistics and Chinese fixed asset investment year book. According to the above formula (2) to determine Q and L values, if α , β must be determined. Promptly it is the total output and labor input quantity. In this paper, the actual GDP (in 1978 as the base year) is used as total output index, The employees over the years is used as a labor input index. he method of the determination of α, β is the least squares (OLS) regression, According to the hypothesis of $\alpha + \beta = 1$ as the time of constant returns to scale, α , β is calculated. The regression equation is as follows:

$$\ln(Q_t) = \ln(A) + \alpha \ln(K_t) + \beta \ln(L_t) + v_t \quad (3)$$

The α , β of $\ln(K_t)$ and $\ln(L_t)$ tests in the Constraint conditions. The test results are shown as follows:

$$\ln(Q_t/L_t) = -0.882 + 0.692 \ln(K_t/L_t) \quad (4)$$

$$\text{Adjusted R-squared} = 0.996 \quad \text{DW} = 1.845$$

It is relatively ideal from the above regression results. Adjusted R-squared=0.996 shows that regression results are significant which proves regression results. The regression results can verify the autocorrelation by equation which calculated $\alpha = 0.692$. According to the hypothesis of $\alpha + \beta = 1$, $\beta = 0.308$ is calculated. Thus, the formula (3) original value is got and the GDP growth rate, capital stock growth rate and the rate of labor force growth is calculated, which gets total factor productivity(TFP)annual growth rate of the 1983-2012, and the contribution of total factor productivity value is received. After the contribution value of total factor productivity getting, this paper will use gray system analysis by Deng Julong. In order that the relation between things from a dynamic perspective, a gray correlation model is established. Making as the behavioral factors of gray correlation model:

$$x_{TFP} = \{x_{TFP}(k) \mid k = 1, 2, 3, \dots, 30\} \quad (5)$$

At the same time, foreign direct investment is made as related factors, Comparative sequence:

$$x_{FDI} = \{x_{FDI}(k) \mid k = 1, 2, 3, \dots, 30\} \quad (6)$$

The absolute difference of corresponding data defining each k :

$$\Delta(k) = |x_{TFP}(k) - x_{FDI}(k)| \quad (7)$$

In the K point, gray correlation coefficient between foreign direct investment and economic growth mode for China:

$$r(x_{TFP}(k), x_{FDI}(k)) = \frac{\min_{FDI} \min_k \Delta(k) + \alpha \max_{FDI} \max_k \Delta(k)}{\Delta(k) + \alpha \max_{FDI} \max_k \Delta_i(k)} \quad (8)$$

The averaging of gray relational coefficients corresponding to all k point which can obtain the gray correlation degree between foreign direct investment and Chinese economic growth mode during the study interval.

$$\xi = \sum_{k=1}^{30} r(x_{TFP}(k), x_{FDI}(k)) \quad (9)$$

It needs to explain that α is in the identification coefficient in (8), the value of most scholars, this paper makes α as 0.5 according to the value of most of the scholars.

CONCLUSION

The calculation of correlation degree is relatively cumbersome, so MATLAB is used. The paper used MATLAB7.8.0 (R2009a) to write the program, and the calculation process is omitted. MATLAB calculation can obtain that the gray correlation between FDI and China economic growth mode is 0.6229 in the research interval. Thus, according to the point of view which gray correlation degree is greater than 0.6, the gray correlation exists between foreign direct investment and China economic growth mode. That is to say that the foreign direct investment will have a certain impact on the economic growth mode.

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