The Impact of FDI on the Economic Growth of the Yangtze River Economic Belt: An Empirical Study Based on VAR Model

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Abstract. FDI is very important to the economic development of a region. The Yangtze River economic belt is one of the important economic core regions in China. In order to study the impact of global foreign direct investment on the economic growth of the Yangtze River economic belt, this paper uses VAR model to analyze the dynamic relationship between FDI and GDP in the Yangtze River economic belt. The results show that FDI has a positive impact on the growth of the Yangtze River Economic Belt in the short term, but not in the long term. At the same time, the economic development of the Yangtze River economic belt has a positive impact on FDI.

1 Research background

As an important link of China's "T" shaped macro strategy, the Yangtze River Economic Belt connects the two most developed core regions (Chengdu-Chongqing region and Wuhan region) with the coastal economic belt. In terms of its economic foundation and development potential, it is second only to the coastal economic belt of China [1]. In a speech at a symposium on promoting the development of the Yangtze River Economic Belt in 2018, Xi Jinping explicitly stated, "The Yangtze River Economic Belt has gathered more than 40% of the country's population and created more than 40 percent of the country's GDP...It is the center of our economy, the center of our dynamism." We can see the important influence of the Yangtze River Economic Belt on China's economy. "Investigation report" for 2020 world investment prospects and development (UNCTAD) showed that：While global foreign direct investment (FDI) has fallen significantly as a result of the Covid-19 outbreak, the demand shock has reduced global FDI volume by 42% from $1.5 trillion in 2019 to about $859 billion, But in China, the use of foreign capital rose 6.2 % to nearly $150 billion.

It shows that China is bucking the trend in the COVID-19 epidemic, which is still one of the most attractive economy of FDI. The total import and export volume of the Yangtze River Economic Belt accounts for about 40% of the country's total, and the importance of FDI for the economic growth of clusters in the Yangtze River Economic Belt is self-evident. Therefore, it is of great significance to study the impact of FDI on the economic growth of the Yangtze River Economic Belt.

2 Review

Studies by scholars have shown that foreign direct investment (FDI) has a significant positive relationship with economic growth [2-5].However, some scholars have proved that the stable relationship between FDI and economic growth is not always significant [6-9].Not only that, FDI has a great difference in the positive driving effect on the economy of different regions [10] and is only effective in some countries [11].Many scholars have analysed the reasons and found that: human capital accumulation [12-13], level of financial development [14-15], Environmental Regulation [16-17], enterprise size [18-19] will affect the effect of FDI on economic growth. Although the effect of FDI on economic growth is not ideal in the short term, some scholars believe that the positive promoting effect of FDI on economy is a long-term trend and the effect will become more obvious as time goes by [20]. These studies show that in order to give full play to the long-term positive impact of FDI on the economy, the restriction of multidimensional absorption threshold on regional economy must be broken. At the same time, it must be mentioned that recent literature has proved that with the existence of an inverted "U" shaped structure between economic growth and FDI, the economic growth brought by FDI will disappear over time.[21]

In recent years, some scholars have further narrowed the research scope to the Yangtze River Economic Belt, thus extending the longitudinal depth of this kind of research. Liu Han et [22] integrated and innovated the previous experience and set three variables to empirically prove the multi-dimensional threshold effect

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between FDI and economic growth in the Yangtze River Economic Belt.

It is found from the above literature that the existing studies mainly focus on the spillover effect of FDI on economic growth, while there are few direct studies on FDI and economic growth in the Yangtze River Economic Belt. Although Liu Han et [22] studied the relationship between FDI and economic growth through urban data, they mainly focused on the causal influence of FDI on economic growth through three threshold variables, and did not explain the interactive influence between the three threshold variables, nor did they explain the interactive influence of two main factors. In view of this, Different from Liu Han et al. [22], who used multiple threshold regression model to fit the relationship between FDI and economic growth, this paper adopted VAR model to study the interactive relationship between FDI and economic growth through the data of 11 prefecture-level cities in the Yangtze River Economic Belt from 2000 to 2018. This paper contributes to a more comprehensive understanding of the impact of FDI on economic growth, enriches the content of the research system on economic growth of the Yangtze River Economic Belt, further confirms the important role of FDI in the development of the Yangtze River Economic Belt, and puts forward suggestions on sustainable policies for the economic growth of the Yangtze River Economic Belt from the perspective of long-term development.

3 Empirical analysis

3.1 Variable selection and data source

This paper mainly studies the impact of FDI in the Yangtze River Economic Belt on economic growth, so the selected variables are mainly to measure the degree of economic development and the scale of foreign direct investment. In this paper, foreign direct investment (FDI) was selected as the explanatory variable, and the gross national product (GDP) of 11 cities in the Yangtze River Economic Belt was selected as the indicator to measure the economic development degree, and was used as the explanatory variable to participate in the model construction

In order to eliminate the possible endogeneity problem, residents' disposable income (DI) was added as the control variable. The data selected in this paper are from 2000 to 2018, all from the annual data column of the National Bureau of Statistics of China.

3.2 Construction of VAR model

Firstly, natural logarithm processing was performed on the data to eliminate possible heteroscedasticity problems. The FDI, GDP and DI after counting the logarithms were LNFDI, LNGDP and LNDI.

In processing time series data, it is necessary to ensure its stationarity. This paper investigates the long-term dynamic correlation between FDI and economic growth in the Yangtze River Economic Belt, so unit root

test should be carried out before the model construction to check the stationarity and prevent false regression. The stationary test among LNFDI, LNGDP and LNDI found that the null hypothesis could not be rejected. Therefore, LNFDI, LNGDP and LNDI were first processed by first-order differential processing to obtain DLNFDI, DLNGDP and DLNDI, and then the unit root test was conducted. The test results were shown in Figure 1.
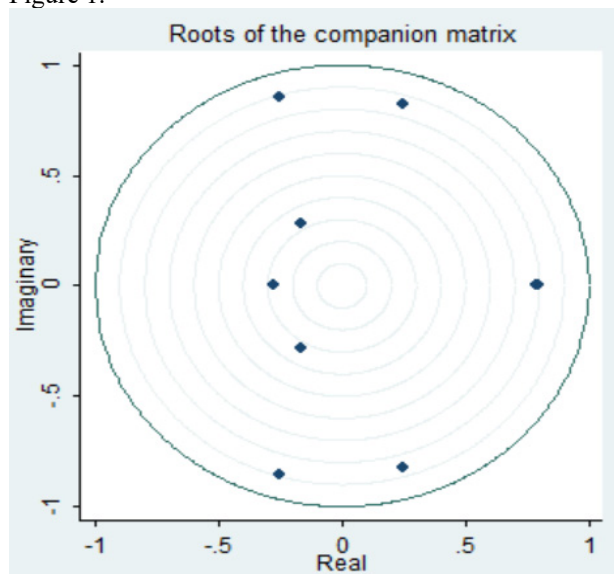

Fig. 1 Unit root test results

As can be seen from Figure 1, all the unit roots fall within the circle, which indicates that the selected data in this paper are stable and the variables selected have a long-term stable relationship, so the VAR model can be established. Vector autoregressive (VAR) model can use all the current variables to regress several lagging variables, which is often used to analyse the interrelated time series data and the dynamic influence on the variable system. Since it was proposed in 1980, it has been widely used in various fields such as economic analysis and financial forecasting. The basic formula is usually as follows:

$$y_t = A_1 \cdot y_{t-1} + \cdots + A_p \cdot y_{t-p} + Bx_t + \varepsilon_t \quad (1)$$

Wherein, y_t represents the m-dimensional endogenous variable column vector, x_t represents the d-dimensional exogenous variable column vector, p represents the lag order, t represents the number of samples, and ε_t represents the residual. According to the results of STSTA regression, the model in this paper can be expressed as:

$$\text{DLNGDP} = \underset{(0.006)}{0.68}\,\text{DLNGDP}_{t-1} + \underset{(0.000)}{0.2}\,\text{DLNFDI}_{t-1}$$
$$- \underset{(0.098)}{0.92}\,\text{DLNDI}_{t-1} + \underset{(0.45)}{0.039} + \varepsilon_t \quad (2)$$

Wherein, the parentheses represent the p value. As can be seen from the regression equation, when OFDI increases by 1%, GDP increases by 0.2% on average.

3.3 Impulse response analysis

Impulse response can reflect the change degree of other observed variables in the model after the external pulse is applied to the set factor. In order to further explain the relationship between FDI and economic growth, impulse response analysis of variables is carried out below.
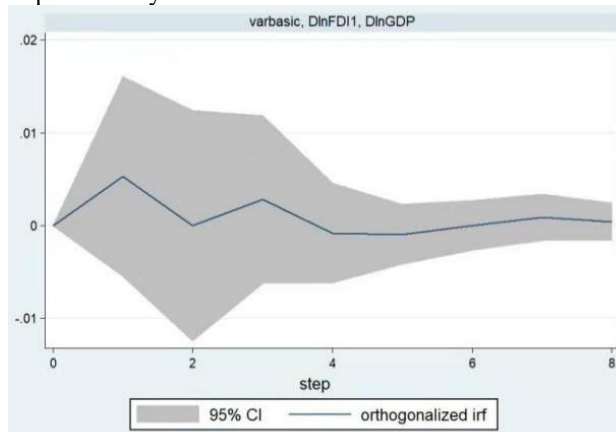

Fig. 2 Impulse response function of GDP to FDI

As can be seen from Fig. 2, when FDI was given a current shock, GDP showed positive shock fluctuations in the early stage, and gradually converged after the fourth period. This indicates that FDI in the 11 cities of the Yangtze River Economic Belt has a positive impact on economic growth in the short term, but the impact is not obvious in the long term .Among them, GDP showed a slight increase in the first and third periods, and a downward trend in the second and fourth periods. It can be explained that economic growth is the result of the comprehensive action of various economic indicators, which is influenced by policies, consumption, culture, export and other factors. Therefore, economic growth is affected by various factors in the short term and tends to be stable in the long term.

4 Conclusions and policy recommendations

Based on the above simulation and analysis of the dynamic relationship between FDI and GDP in the Yangtze River Economic Belt, the following conclusions are drawn:

FDI has a positive impact on the growth of the Yangtze River Economic Belt in the short term, but the long-term impact is not significant. Therefore, it is necessary to seize the early development dividend, make full use of the spill over effect of FDI, and realize the long-term and stable development of regional economy. First of all, we should maintain the stable economic development pattern of the Yangtze River Economic Belt under the long-term impact of the epidemic, and make use of the direct driving effect of international direct investment on the regional economy to achieve short-term stable economic growth. Secondly, it is necessary to introduce international direct investment that is conducive to the economic structural transformation of the Yangtze River Economic Belt, and

reduce the investment of "high pollution, high energy consumption and high emission", not only considering the short-term development goal of the region, but also considering the long-term high-quality development goal of the regional economy. Finally, make full use of the spill over effect brought by foreign investment. By means of demonstration effect, penetration effect and competition effect, the spill over effect of new production technology and organizational management experience brought by foreign direct investment can be fully utilized to reduce the dependence of foreign direct investment, so as to realize the long-term independent development of the economy of the Yangtze River Economic Belt.

In addition, the economic development of the Yangtze River Economic Belt has a certain positive effect on FDI (Liu Hong, 2013; Niu Wenjing, 2019).Therefore, to a certain extent, building a stable environment for international investment in the Yangtze River Economic Belt is conducive to effectively attracting foreign direct investment and maintaining economic growth vitality .Data from the World Investment Report 2020 also show that affected by the Covid-19 outbreak, global FDI will drop by 40%-50% to $1.54 trillion, exceeding the negative impact of the 2008 financial crisis on global direct investment. However, China has actively taken anti-epidemic measures in this outbreak, and has become a pure land for global investment under the impact of the epidemic. The Yangtze river economic belt of foreign direct investment as important in our country, we must seize the opportunity of the COVID - 19 outbreak and make full use of the outbreak of the international and domestic influence differences to keep their own internal impetus driving economic growth. We must construct more mutually beneficial and friendly open, inclusive, sustained and stable investment environment to attract affected by the epidemic situation and international direct investment in a wait state.

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