The Relationship between Foreign Direct Investment and Economic Development——An Empirical Analysis of Shanghai 's Data Based on 2004 - 2015

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Abstract

Based on the annual data from 2004 to 2015, the relationship between foreign direct investment and economic development in Shanghai was studied by using a series of metrological analysis methods ,such as ADF unit root test, E-G cointegration analysis and Granger causality test. Index of Economic development is showed as the Total Retail Sales of Consumer Goods, Capita Disposable Income of Urban Residents, Foreign Trade Imports and Exports. The results show that FDI has a positive relationship to the three economic development indicators, but the impact is limited. In contrast, there is a single causal relationship between import and export trade and FDI.

Keywords

Foreign direct investment; economic growth; cointegration analysis; Granger causality test.

1. Introduction

Shanghai occupies an important geographical position of the Yangtze River estuary. As an inland economic, financial and trade center, Shanghai has become the fastest-growing economy in China in recent years and the most successful economic transformation. It is not only the core city of the Yangtze River Delta and the eastern coast, but also plays an important role in the economic development of the inland areas. At the same time, as one of the earliest cities to open to the outside world, it also has extraordinary performance in foreign trade and attracting foreign investment. According to the National Bureau of Statistics, foreign direct investment reached US$25.129 billion in 2016, with a cumulative total of US$221.747 billion. It can be seen that studying the relationship between overseas direct investment and economic growth has an indispensable practical significance for promoting foreign investment, improving Shanghai's urban competitiveness, and becoming a truly global economic center.

2. Literature Review

The "double gap theory" proposed by American economist Channer in 1969 believes that in order to maintain a certain growth rate of the economy, the savings gap and the foreign exchange gap must be balanced, and the absorption of foreign capital can fill these two gaps at the same time. This theory provides theoretical support for developing countries to make up for the shortage of domestic funds through the use of foreign capital. Firebaugh (1992) compares the economic effects of domestic investment and foreign direct investment in developing countries and finds that although domestic capital contributes more to economic growth than foreign capital, both contribute to the country's economic development. [1] Borenz Lein Gregorio and Lee (1998) argue that foreign direct investment is an important channel for the introduction of new technologies, and its contribution to the national

economy exceeds domestic investment.[2] From a domestic perspective, research on economic growth in China also has Different conclusions. Zhao Jinping (2001) shows that FDI brings a lot of capital to make up for the shortage of domestic capital through econometric analysis. 2%-3% of China's economic growth rate is attributed to foreign capital contribution

Some scholars believe that there are significant effects between FDI and economic growth, such as the economic situation analysis and forecasting group, Wang Lixin, Cao Jiang, Wu Guoxin, Chen Hongjin, and Li Li. Some scholars believe that China's economic growth is an increase in China's gains. One of the factors is Wei Yuxian and so on. Li Xiaojian analyzed the impact of workers on the economic development of China's coastal areas and found that foreign investment has a significant impact on economic growth in coastal areas. After research by Hua Jun and Gu Chaolin, it is believed that there is no significant causal relationship between foreign investment and economic growth in the eastern coastal areas where foreign investment is concentrated. It can be seen that domestic scholars draw conclusions from different perspectives. Not consistent.

This article will discuss the issue of how FDI promotes economic growth in this specific city of Shanghai for in-depth discussion and research, and use the econometric model to analyze the impact of foreign direct investment on various economic indicators in Shanghai over the past 10 years.

3. Data Selection and Processing Instructions

3.1 FDI indicator Selection

The FDI statistical caliber mainly includes three types of new contract items, contract amount and actual use of foreign capital. The newly approved contract project refers to the number of foreign-invested enterprises approved and established in foreign direct investment in a certain region, and the number of approved cooperative development projects. The contract amount refers to the loan that the foreign investor subscribes for in the contract and the charter of the foreign-invested enterprise, and the loan that should be provided directly by the foreign investor to the enterprise with its own overseas funds. . The actual amount of foreign investment used refers to the actual execution amount of the approved contractual foreign investment amount. The foreign investor’s actual amount of capital contribution and the total investment of the enterprise in accordance with the contract (charter) of the foreign-invested enterprise is determined by the foreign investor. There are loans that are actually directly provided to enterprises. The actual use of foreign investment can more effectively reflect the real situation of foreign investment. Therefore, this paper selects the actual use of foreign investment as an indicator to measure the development of FDI.

3.2 Economic Development Indicators

This paper intends to select indicators from three aspects of social consumption, resident income and foreign trade to comprehensively reflect the economic development of Shanghai. The level of social consumption can reflect the actual purchasing power of the society, and indirectly reflects whether the driving force of economic development is powerful or weak. This paper intends to measure the level of social consumption with the total retail sales of social consumer goods; the income index of residents can better reflect the concept of sustainable development, and the purpose of economic development is to The living standards of residents are constantly improving, and income is an important way to improve the quality of life of residents. This paper intends to use the per capita disposable income of urban residents to measure the income of residents; Shanghai is located on the eastern coast, and import and export trade plays an important role in regional economic development. Considering the growth of import and export trade volume helps to infer the overall economic performance of the city. The economic development indicators are as follows:

Table 1: Selection of economic development indicators

The Influence of FDI on Shanghai's Comprehensive Economic Development	FDI indicator	FDI: Actual foreign direct investment
	Economic development indicator	SS: Total retail sales of social consumer goods - social consumption indicators
		AI: Per Capita Income of Urban Residents - Residents' Income Indicators
		FT: Import and export trade volume - foreign trade indicators

The data required for foreign direct investment indicators (FDI) and economic development representative indicators (SS, AI, FT) are shown in Table 2:

Table 2: 2004-2015 FDI and Economic Development Indicators

Unit: 100 million US dollars

Year	Foreign direct investment (FDI)	The total retail sales of social consumer goods (SS)	Per capita disposable income of urban residents (AI)	Import and export trade volume (FT)
2004	65.41	320.88	2014.9	1600.26
2005	68.5	363.80	2276.6	1863.65
2006	71.07	423.49	2593.2	2274.89
2007	79.2	509.64	3108.3	2829.73
2008	100.84	658.59	3838.1	3221.38
2009	105.38	763.27	4222.3	2777.31
2010	111.21	913.82	4702.8	3688.69
2011	126.01	1112.36	5608.4	4374.36
2012	151.85	1242.54	6368.9	4367.58
2013	167.80	1384.00	7084.2	4413.98
2014	181.66	1515.23	7770.4	4666.22
2015	184.59	1626.24	8004.3	4517.33

Data Source: Shanghai Statistical Yearbook, China Statistical Yearbook

The total amount of social consumer goods (SS) and the per capita disposable income (AI) of urban residents are based on the annual average exchange rate of RMB against the US dollar. In order to eliminate the heteroscedasticity of time series, this paper takes natural logarithmic transformation of all variables, and finally obtains four new sequences of lnFDI, lnSS, lnAI and lnFT as the basic data of measurement research.

4. Metrology Model

This paper mainly applies the measurement software EVIEWS 8.0 to the sequence of ADF unit root test and E-G two-step method for cointegration test. Finally, the Granger causality test model is used to quantitatively study the causal relationship between FDI foreign direct investment and economic development indicators.

The cointegration test of the time series model is based on the station's stationarity, and then the least squares method is used for regression analysis. However, in the study of this paper, foreign direct investment (FDI), total retail sales of social consumer goods (SS), per capita disposable income (AI),

and import and export trade (FT) may all be non-stationary. Regression of a non-stationary sequence leads to a pseudo-regression, which leads to the ineffectiveness of the conclusion. Therefore, the unit root test must be performed on the lnFDI and lnSS, lnAI, and lnFT sequences by cointegration theory before regression.

$$\Delta Y_t=\alpha+\beta*t+\rho*Y_{t-1}+\sum_{i=t}^{m}\theta_t\Delta Y_{t-1}+\varepsilon_t \quad (1)$$

(Δ is the first-order difference symbol, ε is the random error term, Y is the time series studied, and m is the optimal lag order. This lag order guarantees the stationarity of the sr error term (white noise)

In order to determine whether foreign direct investment (FDI), total retail sales of social consumer goods (SS), per capita disposable income (AI), and import and export trade (FT) have a long-term stable equilibrium relationship, this paper uses EG two-step method. Cointegration tests are performed on variables. First, estimate the equation using the OLS method:

$$lnSS=\alpha_t+\beta*lnFDI_t+\varepsilon_t \quad (2)$$

$$lnAI=\alpha_t+\beta*lnFDI_t+\varepsilon_t \quad (3)$$

$$lnFT=\alpha_t+\beta*lnFDI_t+\varepsilon_t \quad (4)$$

(α and β are parameters to be determined, and st is the error term of the regression equation)

Second, the singleness of the error sequence {(εt)ˆ} is checked.

In order to deeply analyze the relationship between foreign direct investment (FDI), total retail sales of social consumer goods (SS), per capita disposable income of urban residents (AI), and import and export trade volume (FT), lnFDI and lnSS, lnAI, Granger causality test model of lnFT. See the reference for specific models [3]

5. Empirical Results

5.1 Descriptive Analysis

First, descriptive statistics are drawn on the raw data FDI, SS, AI, and FT before the logarithm to draw a scatter plot to visually show the trend of Shanghai FDI and other economic indicators. Figure 1 is a scatter plot of the raw data for each indicator:

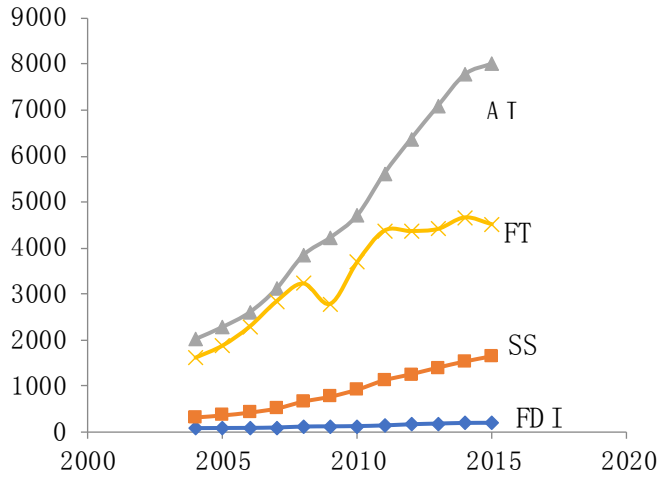

Figure 1: Trends in FDI, SS, AI and FT indicators from 2004 to 2015

It can be seen from the above scatter plot that although the magnitude of the increase is different, the overall trend of FDI and economic development indicators is consistent.

5.2 Unit Root Test Result of Variable Sequence

By descriptive statistics on the four groups of lnFDI, lnSS, lnAI, and lnFT, the timing diagram and the split sequence diagram are drawn, as shown in Figure 2 and Figure 3:

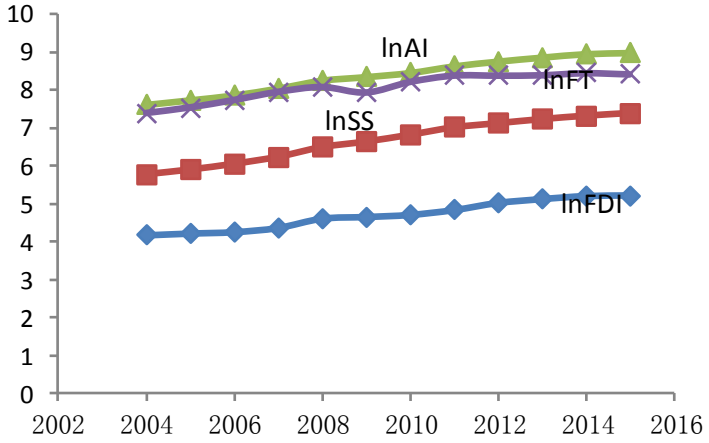

Figure 2: Sequence diagram

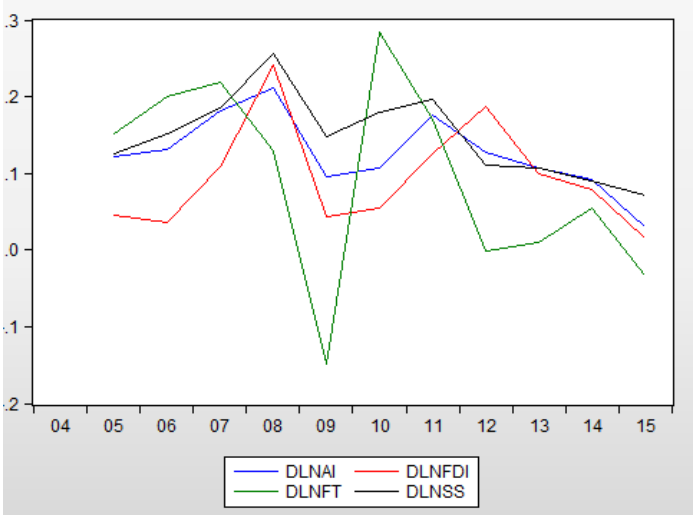

Figure 3: First-order splitting of variables

Figure 4: Second-order splitting graph

Figure 2 shows that all three variables are non-stationary. Figure 3 shows that the variables appear to be stationary after the first-order split of the four variables, but still need to be tested. Figure 4 shows that the variables after the second-order split show significant smoothness and the same period of change, which is a typical feature of the cointegration relationship between variables. To ensure the test results, we still perform a unit root test on the four sequences.

In this paper, the unit root is tested by ADF method, the best lag order is determined by AIC criterion, and the trend term and intercept term are selected according to the time series diagram. Let D2lnFDI, D2lnSS, D2lnAI, D2lnFT be lnFDI, lnSS, lnAI, respectively. Second-order splitting of lnFT. The unit root test results are as follows:

Table 3: Unit root test of variables and unit root test of second-order split

Variable	Test form (C is a constant term, T is a time trend term, K is a lag order)	Statistics of ADF	Limits of ADF			Conclusions
			Significant level of 1%.	Significant level of 5%.	Significant level of 10%.	
lnFDI	(C, T, 2)	-5.501080	-5.521860	-4.107833	-3.515047	stable
lnSS	(C, T, 2)	0.173437	-5.521860	-4.107833	-3.515047	unstable
lnAI	(C, T, 0)	0.900675	-5.521860	-4.107833	-3.515047	unstable
lnFT	(C, T, 0)	-1.510636	-5.124875	-3.933364	-3.420030	unstable
D2lnFDI	(0, 0, 2)	-5.221082	-2.937216	-2.006292	-1.598068	stable
D2lnSS	(0, 0, 0)	-3.873464	-2.847250	-1.988198	-1.600140	stable
D2lnAI	(0, 0, 1)	-3.422824	-2.886101	-1.995865	-1.599088	stable
D2lnFT	(0, 0, 1)	-3.959567	-2.886101	-1.995865	-1.599088	stable

The results showed that the level tests of the four groups of lnFDI, lnSS, lnAI, and lnFT were non-stationary series at a significant level of 1%. After the second-order splitting, the D2lnFDI, D2lnSS, D2lnAI, and D2lnFT sequences all maintain their stability at the 1% significant level, so the original hypothesis is rejected, there is no unit root, and the four sets of sequences are the same order single sequence. Cointegration analysis and Granger causality tests were performed.

5.3 E-G cointegration Test Results

According to the E-G cointegration model two-step method, the coefficients of the cointegration equation are first estimated by the least squares method (OLS). The results are as follows.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.289864	0.331038	-0.875621	0.4018
LNFDI	1.479104	0.070184	21.07454	0.0000

R-squared	0.977980	Mean dependent var	6.665374
Adjusted R-squared	0.975778	S.D. dependent var	0.574529
S.E. of regression	0.089416	Akaike info criterion	-1.840024
Sum squared resid	0.079952	Schwarz criterion	-1.759206
Log likelihood	13.04015	Hannan-Quinn criter.	-1.869946
F-statistic	444.1363	Durbin-Watson stat	0.905583
Prob(F-statistic)	0.000000		

Figure 5: Regression results for lnSS and lnFDI

$$SS=-0.289864+1.479104*FDI+\varepsilon 1 \quad (1)$$

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.504673	0.237770	10.53400	0.0000
LNFDI	1.248397	0.050410	24.76468	0.0000

R-squared	0.983956	Mean dependent var	8.375051
Adjusted R-squared	0.982352	S.D. dependent var	0.483440
S.E. of regression	0.064224	Akaike info criterion	-2.501881
Sum squared resid	0.041247	Schwarz criterion	-2.421063
Log likelihood	17.01129	Hannan-Quinn criter.	-2.531803
F-statistic	613.2892	Durbin-Watson stat	0.894933
Prob(F-statistic)	0.000000		

Figure 6: Regression results for lnFDI and lnAI

$$AI=2.504673+1.248397*FDI+\varepsilon 2 \quad (2)$$

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.841772	0.512611	7.494521	0.0000
LNFDI	0.898955	0.108680	8.271564	0.0000

R-squared	0.872479	Mean dependent var	8.068955
Adjusted R-squared	0.859727	S.D. dependent var	0.369690
S.E. of regression	0.138460	Akaike info criterion	-0.965458
Sum squared resid	0.191712	Schwarz criterion	-0.884640
Log likelihood	7.792749	Hannan-Quinn criter.	-0.995380
F-statistic	68.41876	Durbin-Watson stat	1.010235
Prob(F-statistic)	0.000009		

Figure 7: Regression results for lnFDI and lnFT

$$FT=3.841772+0.898955*FDI+\varepsilon 3 \quad (3)$$

According to the Engle-Granger test, if there is a cointegration relationship between the variable lnFDI and lnSS, lnAI, lnFT, the residual sequence {(εt)ˆ} must be a single integer. For this purpose, the ADF unit root test of the residual sequence is performed. . The results are shown in Table 4.

Table 4: Residual sequence test results

Residual sequence	Test form (C is a constant term, T is a time trend term, K is a lag order)	Statistics of ADF	P-value	Conclusions
e1t	(0,0,1)	-2.814384	0.0100**	stable
e2t	(0,0,0)	-2.627598	0.0139**	stable
e3t	(0,0,1)	-2.987353	0.0072***	stable

Note: *** is significant at the 1% level, and ** is significantly lower at the 5% statistical level.

The test of random error term shows that the residual sequence {(εt)ˆ} is stable at the critical level of 1%, that is, the second-order cointegration between lnFDI and lnSS, lnAI and lnFT, so there is a long-term stable equilibrium. relationship. In addition, according to the results of the regression equation, the R2, R2adjust, F values can be seen to have a good fitting effect. Prob (F-statistic) in all three regressions is completely close to 0, indicating that there is a significant correlation through the test.

5.4 Granger Causality Test

There is a long-term equilibrium relationship between foreign direct investment (FDI) and total retail sales of social consumer goods (SS), per capita disposable income (AI) and import and export trade (FT), but it does not mean that there is a causal relationship between them. Relationship, if there is a causal relationship, what is the direction of the causal relationship? This requires a Granger causality test. The purpose is to solve the extent to which a variable's variation is caused by the other side of the variable. The most critical of the Granger causality test is to determine the lag period. This paper determines the Granger test by the bivariate vector autoregressive model (VAR) in the Eviews 8. 0 measurement software according to the minimum criteria of the Achiid Information Criterion (AIC). The best lag period. The regression results are shown in Table 5.

Table 5: Granger Granger causality test results

Null hypothesis	Number of observations	F value	P value	Accept or reject the null hypothesis
lnFDI is not the granger of lnAI	9	2.94400	0.1636	Accept
lnAI is not the granger of lnFDI	9	0.7200	0.5407	Accept
lnFDI is not the granger of lnFT	10	18.2079	0.0037	Reject
lnFT is not the granger of lnFDI	10	2.32258	0.1713	Accept
lnFDI is not the granger of lnSS	8	0.21857	0.8780	Accept
lnSS is not the granger of lnFDI	8	3.37928	0.3757	Accept

The Granger causality test shows that there is a single causal relationship between lnFDI and lnFT at the 1% confidence level, which means that the growth of foreign direct investment will promote the growth of import and export trade. In addition, there is no one-way causal relationship between the growth of FDI and the total retail sales of consumer goods and the per capita disposable income of urban residents, indicating that FDI has a limited role in promoting these two economic indicators.

6. Conclusions and Recommendations

First, through regression analysis and cointegration analysis of the relationship between FDI and Shanghai's economic growth, it can be seen that since 2004, there has been a long-term cointegration relationship between FDI and Shanghai's economic growth, and the amount of foreign direct investment increased by 1 percentage point. The total retail sales of consumer goods increased by 1.4 percentage points, the per capita disposable income of urban residents increased by 1.2 percentage points, and the volume of import and export trade increased by 0.8 percentage points. In the long run, FDI has a certain role in promoting the dynamic growth of the economy, but the magnitude is not very large. The Granger causality analysis of FDI and Shanghai's economic growth shows that: Granger causal effect of FDI growth on import and export trade growth is more intense, and the Granger causal relationship between the two changes with the lag period, and the mutual influence is certain. Lag period.

Second, at present, Shanghai's FDI is more concentrated in manufacturing, while modern high-efficiency agriculture, tertiary industry, especially financial services, have less investment, and the field of foreign direct investment needs to be further relaxed within a reasonable range. The quantity and investment direction of FDI can be adjusted through relevant industrial policies. We must never blindly pursue the absolute quantity of FDI. Under the background of creating an “international financial center”, we can appropriately and reasonably and gradually relax foreign direct investment. Invest in restrictions in the relevant financial sector.

Third, while creating conditions to attract foreign direct investment, we must also make efforts to use and control the current FDI, and increase marketing models such as advanced management concepts, mature and efficient core technologies, and high input and output. The absorption, summarization and re-creation of spillover effects have enabled them to give full play to the role of economic growth, which has caused many products to slowly transition from "Made in China" to "Created in China" and further promote the transformation of economic growth mode.

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