A STUDY OF FOREIGN DIRECT INVESTMENT AND ECONOMIC GROWTH IN GUANGXI

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AN INDEPENDENT STUDY SUBMITTED IN THE PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE DEGREE OF MASTERS IN BUSINESS ADMINISTRATION

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Abstract

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The paper focuses around the theoretical hypothesis that "FDI" is an additive to economic growth in Guangxi". It is believed that FDI systematically penetrates all possible mechanisms of economic growth in Guangxi with its "package"resource advantage, thus transforming from an exogenous variable to an endogenous power. Taking this as the basic analytical framework, this paper examines the relationship between FDI and Guangxi's economic growth, and the mechanism of FDI's role in Guangxi's economic growth.

This paper will empirically analyze Guangxi FDI and GDP data through an economic growth model, multivariate hysteresis distribution model and Granger causality test analysis. The empirical evidence shows that foreign direct investment promotes economic growth in Guangxi, and foreign direct investment promotes Guangxi's economic growth. Finally, through the empirical conclusions, and recommendations of this study possible policy recommendations for Guangxi's

economic development, and contributions to the prosperity and development of Guangxi's economy are offered.

Keyword:Foreign direct investment, Economic growth,Guangxi

Approved

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Chapter I Introduction

1.1 Research Background

In the process of economic globalization, information networking, trade, and investment liberalization, the degree of linkage and influence between the economies of the world has continuously deepened and strengthened. There are many ways and channels of entry in the process of world economic integration. The most important ones are international trade, international direct investment (also known as foreign direct investment, or FDI) and information technology dissemination. Economic globalization and the development of international trade and international investment are one of the main reasons for the post-war world economic growth. For a long time, international trade has dominated the world economy and has had a major impact on the economies of all countries in the world. It has been called "the engine" for Western world economic development by Western scholars. However, since the 1960s, international direct investment has developed rapidly, capital flows and stocks have expanded dramatically, and gradually become the dominant force in the world economy. The 1992 World Investment Report published by the United Nations Center for Transnational Corporations first proposed that foreign direct investment has become the "engine" for promoting the world economy. Especially in the 1990s, the rapid growth of international direct investment became the main force driving economic globalization. International direct investment and its carrier multinationals play a very important role in the world economic arena.

Since China's reform and opening up, China's domestic FDI inflows have shown a rapid growth trend. Since 1993, China's use of FDI has been ranked second in the world after the United States, and it is the country that uses the most FDI in developing countries. In 2011, FDI inflows to China reached US$116.01 billion, an increase of 9.72% year-on-year. It can be seen that the influx of large amounts of FDI has played a key role in promoting China's economic growth, not only making up for

the shortcomings of China's domestic capital shortage, but also bringing advanced technology, knowledge and management experience, etc. China's economic growth.

Guangxi, as an important autonomous region in western China, has been increasing in scale since the reform and opening up in 1978, from $30 million in 1990 to $1.035 billion in 2010. On January 1, 2010, the free trade zone between China and the 10 ASEAN countries was officially launched. Guangxi took advantage of the frontier areas of China-ASEAN cooperation. In 2011, it used foreign direct investment of 1.314 billion yuan, an increase of 8.4% over the previous year.

1.2 Status of relevant research at home and abroad

1.2.1 Status of foreign research

There are many studies on the relationship between FDI and economic growth in foreign countries. Most foreign scholars choose one or more countries to conduct empirical analysis across long-term economic data to explore the relationship between FDI and economic growth. With the deepening and development of the research, scholars no longer satisfy the verification of the linear relationship between the two, and more and more gradually explore the specific reasons and causal relationship of the impact of FDI on economic growth. Choe (2003) used the panel data VAR model proposed by Holtz-Eakin et al. (1988) to analyze the relationship between foreign direct investment and economic growth in 80 countries from 1971 to 1995 and found that there is a relationship between foreign direct investment and economic growth. Two-way causality, but the Granger causal relationship between foreign direct investment and economic growth is weaker than the causal relationship between economic growth and foreign direct investment. Laura Alfaro et al. (2004) analyzed the sample data of the two groups of countries from 1975 to 1995, and concluded that foreign direct investment itself does not contribute significantly to economic growth, but that countries with developed financial markets have benefited greatly.

Adegbite and Ayadi (2010) pointed out that FDI helps to fill the domestic income generation gap in a developing economy, as most developing country governments do not seem to be able to generate enough income to meet their spending needs. Other benefits are the external form and the use of foreign technology. Foreign direct investment includes; external resources include technical, management and marketing expertise and capital. All of these government policies that have a considerable impact on the productive capacity of the host country and stimulate the production base of the economy depend to a large extent on the foreign direct investment she controls, including the adequate amount of management, funding and technical resources to boast the existing Capacity of production capacity (Omankhanlen, 2011)

Since the beginning of the last century, foreign countries have begun to develop research on foreign direct investment and host country economic growth. According to the dynamic economic growth model, R.E Harrod pointed out that when a country's internal savings cannot support its economic growth, it can use foreign powers to actively introduce foreign capital to make up for the lack of domestic funds and increase the domestic economic development. In the 1960s, American economists A.M. Sturout and Qian H. Chenery proposed the "double gap theory". Foreign capital investment brought by capital introduction countries can solve the problem of foreign exchange gap, which can further promote the economic growth of the host country. T.W. Swan, a representative of the neoclassical growth school, pointed out that technological advancement has played a decisive role in the various factors affecting economic growth. Paul.M.Romer et al. of the New Economic Growth Model School included factors such as “technical spillovers” and “technical externalities” as endogenous variables, explaining the contribution of production factors such as human resources and technology to economic growth.

1.2.2 Status of domestic research

Domestic scholars also use China's national data and regional data as samples to select different perspectives and study the relationship between regional and inter-provincial FDI and economic growth. Zhao Juan (2012, No. 04) empirically analyzed Guangxi FDI and GDP data through cointegration analysis, Granger causal analysis and error correction model, which proved that there is a one-way Granger relationship between Guangxi FDI and GDP. LNFDI is the Granger cause of LNGDP, LNGDP is not the Granger cause of LNFDI; LNFDI has a significant long-term equilibrium relationship with LNGDP; Zhang Jianhua et al. (2003) used the econometric model for 39 industries and 21 in Guangdong Province from 1997 to 1999. The city conducted an empirical analysis, and the results show that the infectious effect and linkage effect of FDI in Guangdong Province are significant, and a certain aggregation effect is formed, which has a significant impact on economic growth. Jiang Jinfan (2004) tested the capital effect and spillover effect of foreign direct investment through the economic growth model and the Granger causality test to obtain the mechanism of foreign direct investment in China's economic growth.

In summary, although we have not found any direct research on the relationship between foreign direct investment and economic growth in Guangxi, we can still find the theoretical research fulcrum supporting this article from the discussion of the above scholars' related articles; this paper is closely integrated with Guangxi foreign direct The data and empirical evidence of investment and economic growth discuss these views, and thus put forward practical proposals for Guangxi local governments to meet the economic development of Guangxi.

1.3 Research questions

Under the background of the influx of FDI in China, this paper will focus on the role and promotion mechanism of foreign direct investment in Guangxi's economic growth. It is intended to answer the following basic questions through theoretical and empirical analysis: (1) Does foreign direct investment promote Guangxi's economic

growth? ? If so, (2) What are the mechanisms (avenues) for foreign direct investment to promote economic growth in Guangxi? Through the above questions, it is of great theoretical and practical significance to study and analyze how Guangxi can better utilize foreign capital to develop the local economy in the western development strategy.

1.4 Research purposes

The purpose of this paper is to verify the relationship between FDI and Guangxi's economic growth and the mechanism of FDI's promotion of Guangxi's economic growth. In fact, it is expected to scientifically summarize the past of foreign direct investment in Guangxi, explain its current situation, and explain the future economy of Guangxi. Development makes rational recommendations.

Chapter II Literature Review

2.1 History

In the pre-Qin period of Guangxi, there was a high civilization in the Neolithic Age and the Bronze Age. There were cultural relics such as the sacred rock ruins, the Bailian Cave ruins, and the Qilin Mountain in the 7000 years. During the pre-Qin period, Guangxi was part of the Baiyue area, Zhuang and Yi. It is the oldest indigenous people in Lingnan, Guangxi, which originated from the different Yue people's branches in the pre-Qin and Baiyue. After the Qin and Han Dynasties, Han and Miao, the northern Central Plains moved southwardly and the indigenous peoples lived in harmony, and the various ethnic groups merged to foster the birth and development of various cultures. On the basis of the original Baiyue culture, they formed a unique culture of Guiliu and Lingnan. . It is one of the birthplaces of Chinese civilization. Guangxi is the host of the China-ASEAN Expo. It plays an important role in the economic exchanges between China and Southeast Asia and is the most convenient sea passage in the Southwest.

Guangxi's foreign trade has a long history. As early as the 2nd century BC, Guangxi had trade relations with Vietnam, Malaysia, Indonesia, Myanmar, India, and Sri Lanka. Since the Han and Jin Dynasties, the coastal ports of Guangdong and Guangxi have been connected to Southeast Asia, Africa and Europe. Become the 'Maritime Silk Road' in southern China. After the second half of the 19th century, due to the opening of Beihai, Zhangzhou, Nanning and Longzhou, Guangxi's foreign trade also expanded.

2.2 Geography

Guangxi is located in the southern part of the motherland, between 104°28′～112°04′ east longitude and 20°54′～26°24′ north latitude. The Tropic of Cancer

crosses the middle. It is bordered by Guangdong Province in the east, Beibu Gulf in the south and Hainan Province across the sea. It is adjacent to Yunnan Province in the west, Hunan Province in the northeast, Guizhou Province in the northwest, and the Socialist Republic of Vietnam in the southwest.

Region

The administrative area has a land area of 237,600 square kilometers, and the jurisdiction of the Beibu Gulf is about 40,000 square kilometers.

Administrative division

Guangxi governs 14 prefecture-level cities, 111 county-level administrative districts (including 40 municipal districts, 8 county-level cities, 52 counties, 12 autonomous counties), and 1247 township-level administrative districts (including 120 streets and 722 towns, 346 townships, 59 ethnic townships).

Climate

Guangxi is located at a low latitude. The Tropic of Cancer runs through the central part of the country, with a tropical ocean to the south, Nanling Mountain to the north, and Yunnan-Guizhou Plateau to the west. It is a subtropical monsoon climate zone. The climate is warm, the rain is abundant, and the light is abundant. In summer, the sunshine time is long, the temperature is high, the precipitation is much, the winter sunshine time is short, and the weather is dry and warm.

2.3 Foreign direct investment in Guangxi

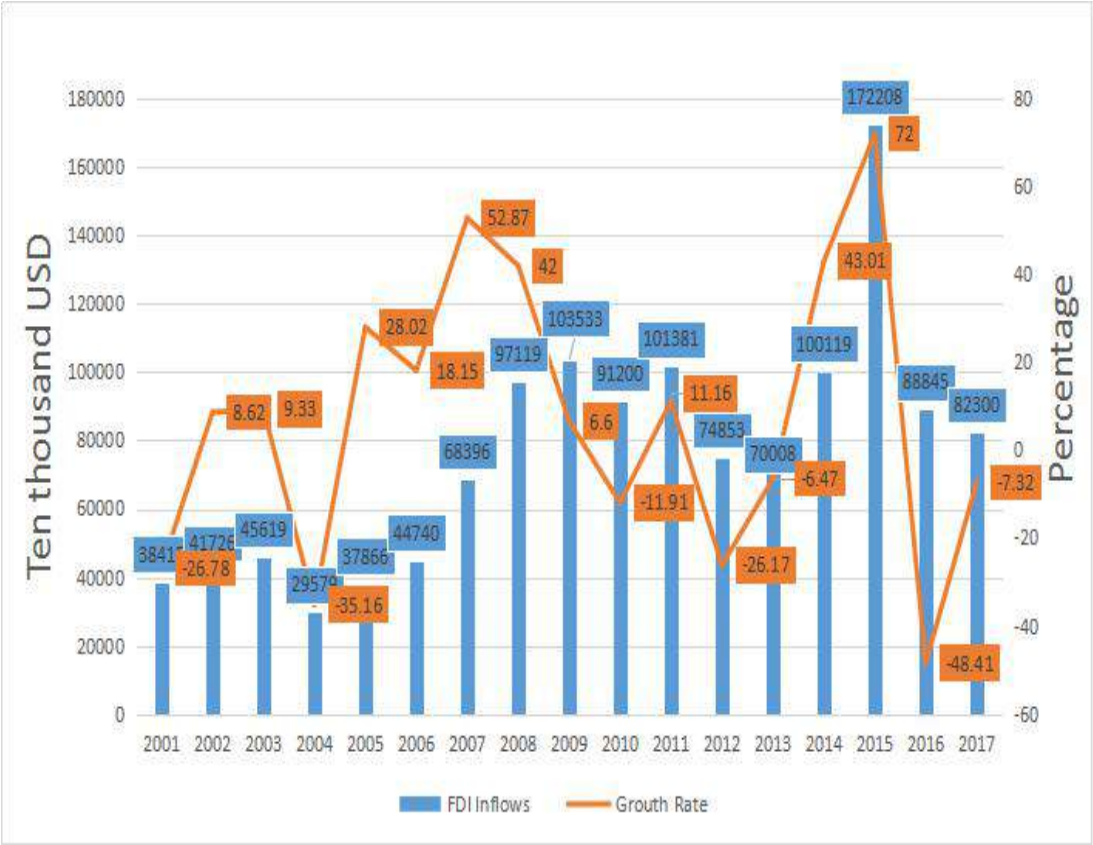
2.3.1 Status of Foreign Direct Investment in Guangxi

The continuous deepening of China's reform and opening up and the continuous expansion of the foreign economy have made Guangxi's foreign trade show a good development trend. As of 2018, Guangxi has established trade relations with 173 countries and regions on five continents, and has trade institutions in the United States, Japan, France, Germany, Singapore and other countries and Hong Kong and Macao. More than a thousand. The development of Guangxi's foreign trade is of great significance to promoting Guangxi's economy and realizing the strategic goal of "enriching the people and revitalizing Guangxi"

Guangxi and ASEAN are connected by mountains and rivers, with similar cultures, similar development history, and a long history of friendly exchanges between the people. In recent years, especially since the annual ASEAN Expo has settled in Nanning, the capital of Guangxi, it has continuously deepened cooperation in various fields. The comprehensive development of economic and trade relations between Guangxi and ASEAN has brought tangible economic benefits to both sides, thus promoting the rapid development of bilateral trade.

In recent years, with the implementation of the strategy of developing the western region and the completion of the ASEAN Free Trade Area and the Pan-Beibu Gulf Economic Zone, Guangxi's economy has developed rapidly and foreign trade has continued to grow. From 2001 to 2013, Guangxi's GDP growth rate exceeded 9%. At the same time, Guangxi FDI and foreign trade have experienced a development process from less to more, and the links with the economy are getting closer.

Figure 2.3.1:FDI in GuangXi



Source: Guangxi Statistical Yearbook

The flow of FDI increased at staggering rate of 52.87%,42%， 43.01% and 72% id FY 2007,FY2008，FY2014 and FY 2015 respectively than that of FY2006, FY2007，FY2013 and FY2014.The flow of FDI totals at USD 683.96 million,USD 971.19 million，USD 1001.19 million and USD 1722.08 million in FY2007,FY2008，FY2014 and FY2015 respectively.After 2004, foreign direct investment inflows have been growing for five consecutive years. In FY2015, foreign direct investment in Guangxi increased to USD 1722.08 million, but foreign direct investment inflows in the next fiscal year have declined. It is worth noting that foreign direct investment into Guangxi has been lower than in the eastern provinces of China.

From 2001 to 2017, although foreign direct investment in Guangxi has fluctuated, it is still in an upward trend. Compared with the eastern region, Guangxi's foreign direct investment is still at a low level.

2.4 Trade and investment

Trade

The economic performance of the Guangxi Zhuang Autonomous Region over the past two decades has been dynamic and strong. More than half of Guangxi's exports go to Asia (especially Southeast Asia), thanks in part to ASEAN's good market access for Guangxi exports. So far, the most important export industry in Guangxi is Mechanical & Electrical Products. (Guangxi Statistical Yearbook) each year.

Table 2.4.1： Total Import & Export Value of Foreign Trade with Guangxi 2006-2016 (US$ million)

Year	Total Export Value	Total Import Value	Balance
2006	3598.63	3075.35	523.28
2007	5113.17	4163.69	949.48
2008	7351.17	5890.62	1460.55
2009	8371.10	5834.90	2536.20
2010	9609.88	8096.21	1513.67
2011	12458.59	10872.24	1586.35
2012	15468.41	14005.27	1463.14
2013	18694.99	14141.91	4553.08
2014	24330.04	16223.01	8107.03
2015	28025.70	23236.45	4789.25
2016	23029.34	24867.60	-1838.26

Table 2.4.2：ASEAN trade in goods with Guangxi 2006-2016(US$ million)

Year	Total Export Value to ASEAN	Total Import Value from ASEAN	Balance
2006	984.74	841.95	142.79
2007	1734.17	1174.29	559.88
2008	2719.29	1262.78	1456.51
2009	3617.29	1330.44	2286.85
2010	4588.35	1937.24	2651.11
2011	6824.93	2733.30	4091.63
2012	9337.44	2711.21	6626.23
2013	12583.90	3330.86	9253.04
2014	17073.16	2812.85	14260.31
2015	19455.24	9558.20	9897.04
2016	99193.16	84350.39	14842.77

It can be seen from the above two data charts: 1: The trade between Guangxi and foreign countries has increased year by year in the past ten years; until 2016, the total import value of Guangxi was greater than the total export value. For the first time since 2006, there was a trade deficit. 2: In the past ten years, the trade between Guangxi and Southeast Asian countries has also increased year by year. The total import and export volume has increased from USD 841.95 million in 2006, USD 984.74 million to USD 84350.39 million in 2016, USD 99193.16 million, and the

total import and export volume is about It has grown more than a hundred times. The two data show that Guangxi foreign trade has strong economic vitality.

Investment

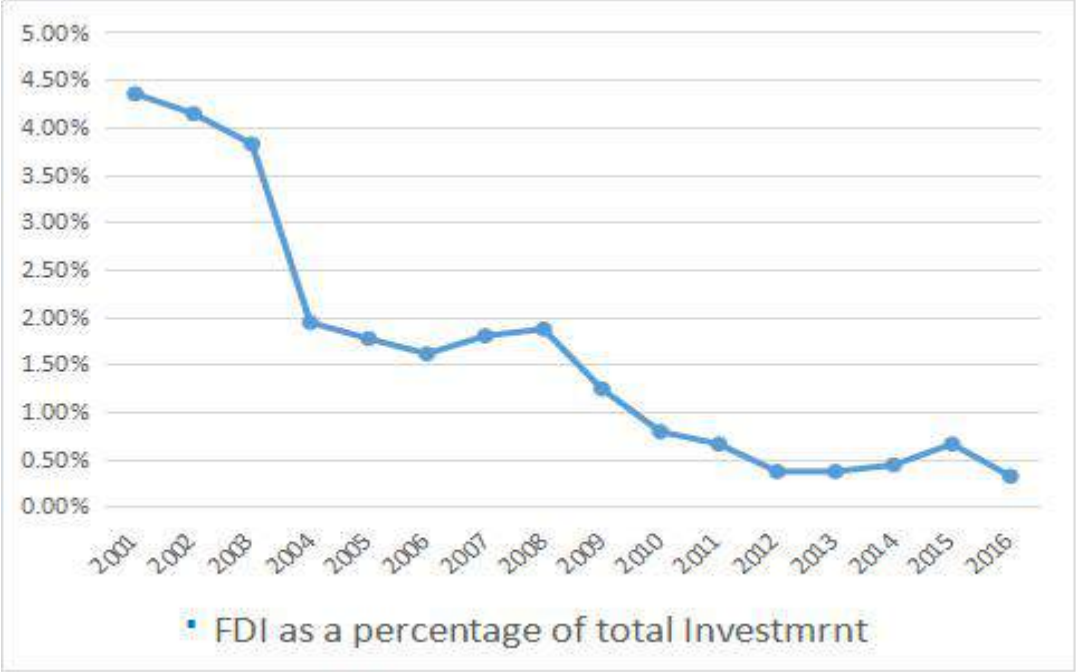
According to the statistics of foreign direct investment of Guangxi Statistical Information Network, Hong Kong, China, Singapore, British Virgin Islands, the largest investor from 2001 to 2016. Foreign Direct Investment (FDI) is an investment involving long-term relationships that reflects the lasting interests and control of resident entities in an economy of an enterprise in another economy. The component of foreign direct investment is the direct investor's purchase of equity capital in the shares of another country's enterprise, as the debt transaction and reinvestment income between the parent company and the affiliated company, as the direct investor's profit not distributed as dividend or reinvestment. Share. Foreign direct investment in Guangxi mainly includes 100% foreign investment and joint ventures between Guangxi investors and foreign investors. The investment takes the form of equity, borrowing and reinvested earnings from existing projects (the top eight investment countries or regions are foreign direct investment in Guangxi, 2017)

Table 2.4.3:The Top 8 investing countries or regions in terms of investment amount from 2010 to 2016 are as follows:(Ten thousand USD)

	year	2010	2011	2012	2013	2014	2015	2016
Countries and Regions								
Hong Kong, China		52114	54257	42352	37047	54020	54414	36358
Macao, China		2579	2910	445	669	972	385	194
Japan		1347	1480	6	13	21	320	88
Singapore		6010	3094	2964	-	1105	44931	18251
Taiwan, China		990	972	363	186	791	834	210
Thailand		590	-	-	790	663	1056	-
United States		135	11	3024	18	719	412	56
British Virgin Islands		11708	6044	5546	9659	8589	7416	3545

As can be seen from the above data, the major countries or regions of foreign direct investment in Guangxi are concentrated in Asia, which gives the Guangxi government a message: attracting foreign direct investment outside of Asia is the top priority for foreign direct investment growth in Guangxi.

Figure 2.4.1：FDI as a percentage of total investment



Foreign direct investment does not contribute to the total investment of the government's macroeconomic framework. The share of foreign direct investment in total investment showed a downward trend. The percentage of foreign direct investment in total investment was the highest in fiscal year 2001, while the contribution rate of foreign direct investment in total investment was 4.35%. In fiscal 2002, the ratio of foreign direct investment to total investment was 4.14%. After a continuous decline in five consecutive fiscal years, the share of foreign direct

investment in total investment increased in fiscal 2007. In fiscal year 2007, foreign direct investment accounted for 1.80% of GDP. From fiscal year 2008 to fiscal year 2012, the share of foreign direct investment in total investment continued to decline. In the past ten years, although the proportion of Guangxi's FDI in total investment has continued to decline, the total amount of FDI in Guangxi has indeed continued to grow.

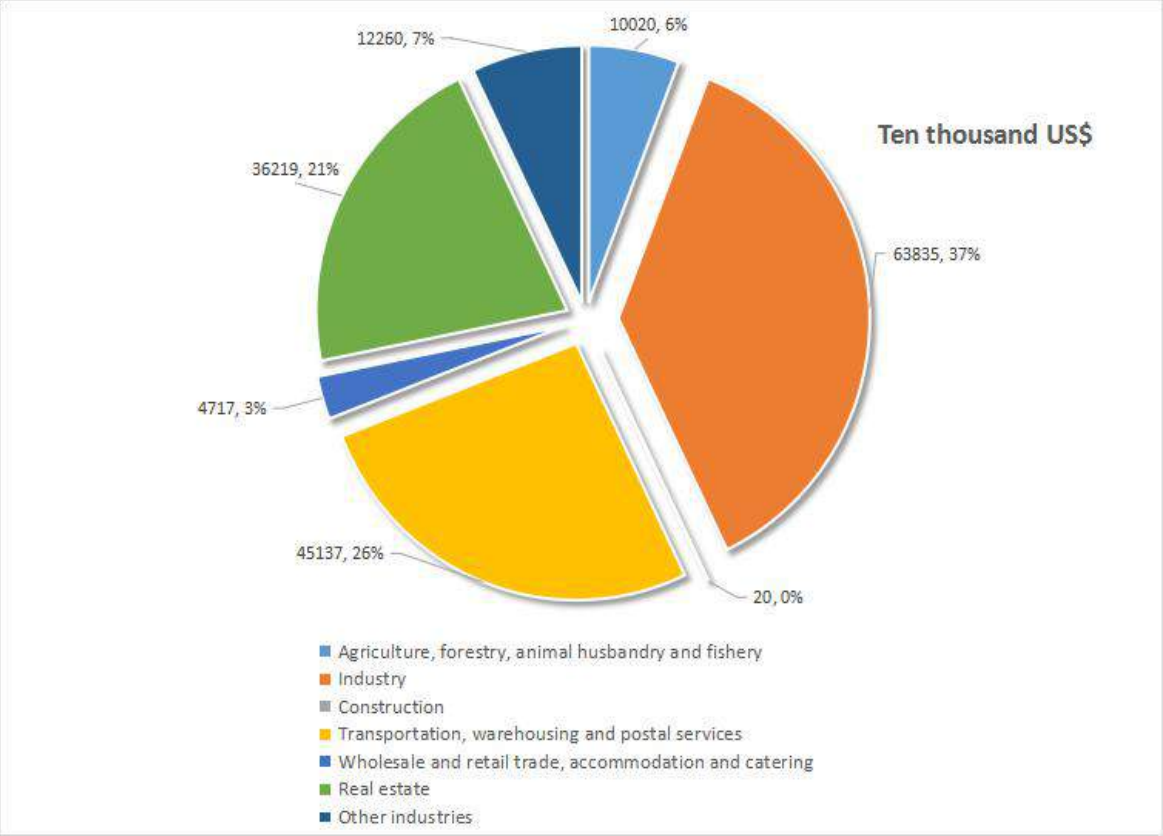
2.5 Sources of foreign direct investment

At present, Hong Kong, Singapore, and the British Virgin Islands are the three major sources of FDI in Guangxi. There are few developed regions in Europe and the United States. In 2015, Guangxi FDI sources accounted for 31.6% of Hong Kong's FDI, Singapore accounted for 26.09%, and the British Virgin Islands. It accounts for 4.31%, and the proportion of other regions is small.

2.5.1 Foreign direct investment inflows in major sectors

FDI inflows the major sectors for the period 2015 arranged in descending order of magnitude were:Industry (US$ 638.35 million),Transportation, warehousing and postal services(US$ 451.37 million),Real estate(US$ 362.19 million),Other industries(US$ 122.60 million),Agriculture, forestry, animal husbandry and fishery(US$ 100.20 million)which were 37%、26%、21%、7%、6% respectively towards the Contribution of total FDI inflow.

Figure 2.5.1:Major sector FDI inflows during 2015



In FY2015, foreign direct investment inflows from the industrial sector increased significantly by US$170.57 million, or 36.46% to US$638.38 million, compared with US$47.55 million or 9.23% in the same period last year.

In FY2015, foreign direct investment inflows from the transportation, warehousing and postal sectors increased significantly by US$428.74 million or

1894.56% to US$451.37 million, compared with a decrease of US$35.67 million or 61.18% in the same period last year. Annual fiscal year.

In FY2015, foreign direct investment inflows from the real estate sector decreased by US$44.54 million or 10.95% to US$362.19 million, compared with US$368.79 million or 972.03% in the same period last year.

FY2015, foreign direct investment inflows from other sectors increased significantly by US$48.66 million or 65.81% to US$122.60 million, compared with US$31.84 million or 75.63% in the same period last year.

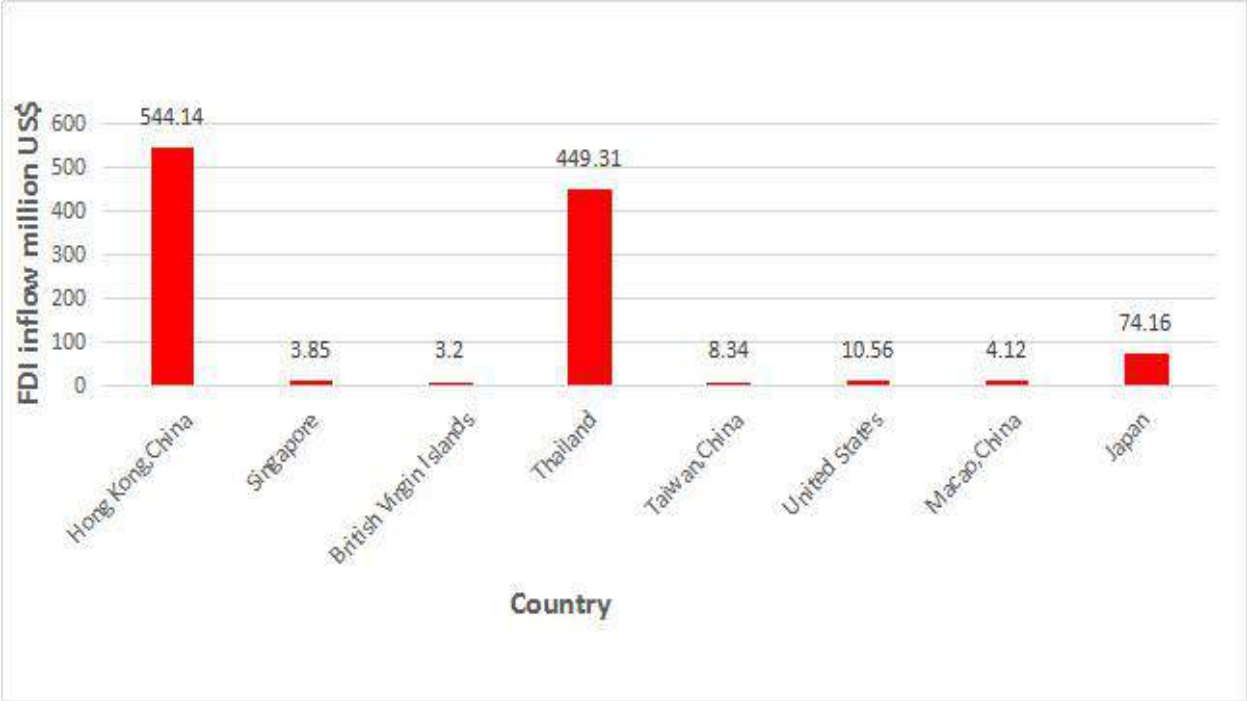
In FY2015, foreign direct investment inflows from the Agriculture, Forestry, Animal Husbandry and Fishery Sector increased significantly by US$97.10 million or 3132.26% to US$100.2 million, compared with a decrease of US$3.15 million or 50.4% in the same period last year.

2.5.2 Foreign direct investment inflows from major countries

FDI inflows from major countries for the period of 2015 arranged in descending order of magnitude were: Hong Kong, China (US$ 544.14 million), Singapore (US$ 449.31 million), British Virgin Islands (US$ 74.16 million), Thailand (US$ 10.56 million), Taiwan, China (US$ 8.34 million), United States (US$ 4.12 million), Macao, China (US$ 3.85 million), Japan (US$ 3.20 million) which were 31.6%, 26.09%, 4.31%, 0.61%, 0.48%, 0.24%, 0.22% and 0.19%

Respectively towards the contributions of total FDI inflow.

Figure 2.5.2:Major country FDI inflows during 2015



2.6 Economy

Basic economic facts

GDP:US$ 3021.67 billion (2017)

GDP Per Capital：US$6215.56 (2017)

Annual Growth：7.3% (2017)

Major Industry: agriculture, forestry, animal husbandry and fishery, industry, construction, transportation, warehousing and postal services, wholesale and retail trade, accommodation and catering, real estate, and other industries.

Major trading partners: Hong Kong, China, Macau, Japan, Singapore, Taiwan, Thailand, United States, British Virgin Islands.

In the 2017 China National Statistical Yearbook, China's economic growth rate in fiscal 2017 reached 6.9%, while the economic growth rate of the Guangxi Zhuang Autonomous Region reached 7.3% (FY2017), with a target of 7.5%; basically meeting the expected target.

Exchange rate：US$ = CNY 6.75　　(2017)

2.7 FDI Definition and Type

2.7.1 Definition of FDI

Foreign direct investment is called a country's company in its classic definition, and a facility (factory) is built in another country for physical investment. Direct investment in building buildings, machinery and equipment is not synchronized with investing in securities (indirect investment).

In recent years, due to the rapid growth and changes in the global investment model, this definition has been extended to include all acquisitions outside the country in which the investment company is located.

Therefore, foreign direct investment can take many forms, such as directly acquiring foreign companies, building facilities, or investing in joint ventures or establishing strategic alliances with one of the local companies, and providing technology and intellectual property licenses.

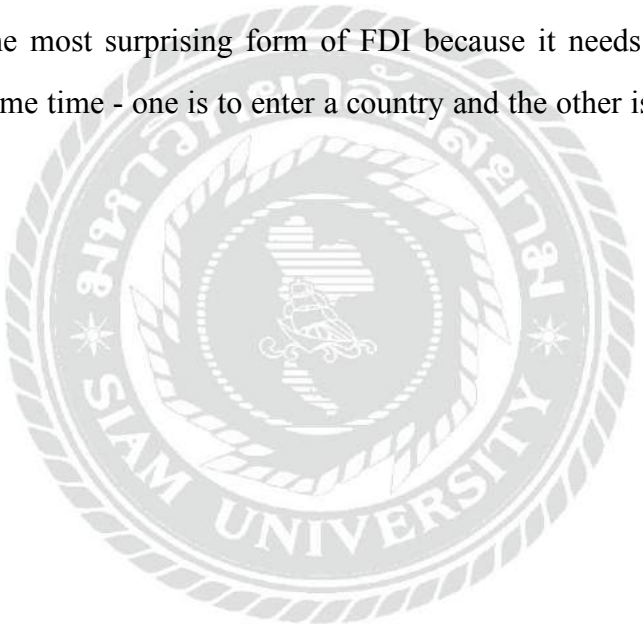
2.7.2 Types of FDI

Strategically, there are three types of foreign direct investment -

Horizontal - In the case of horizontal foreign direct investment, the company conducts all the same activities abroad in the country. For example, Toyota assembles cars in Japan and the United Kingdom.

Vertical - Different types of activities are carried out abroad in vertical missions. In the case of forward-looking foreign direct investment, foreign direct investment brings the company closer to the market (for example, Toyota buys car dealerships in the United States). In the case of vertical foreign direct investment backwards, international integration can be traced back to raw materials (for example, Toyota acquires a majority stake in tire manufacturers or rubber plantations).

Group - In this type of investment, the investment is to obtain an unrelated business abroad. This is the most surprising form of FDI because it needs to overcome two obstacles at the same time - one is to enter a country and the other is to work in a new industry.



Chapter III Methodology

3.1 Introduction

The analysis of the previous chapters provides us with an overall framework and detailed description of the mechanism of foreign direct investment in promoting economic growth in Guangxi. As the hypothesis proposed at the beginning of this paper, foreign direct investment does have economic growth in many aspects. Important impact, but so far, we still lack a comprehensive evaluation of the extent of this impact, and more importantly, the establishment of the hypothesis also needs the support of empirical data, so the empirical research around this topic will be this article. Important content that is indispensable.

3.2 Data Analysis

Using the analysis of the expanded economic growth model, we will further provide a cornerstone for the contribution rate and contribution of relevant factors.

Using the analysis of the multivariate lag distribution model as a remedy, if the regression of the “expanded economic growth model” is difficult to achieve the desired effect, we need to change the model and finally obtain an effective regression model through trial and error.

Expanding the Granger causality test to examine the capital effects and spillover effects of foreign direct investment

Test, which leads to the mechanism of foreign direct investment in the process of economic growth in Guangxi.

3.3 variables

3.3.1 dependent variable

GDP： refers to the market value of all final goods and services produced within a country in a given period.

Domestic investment: refers to the investment made by the government, enterprises and individuals in their own countries. FDI inflows may squeeze out or replace domestic investment because FDI has the advantage of technology or management compared to domestic investment, so it may squeeze some domestic investment.

3.3.2 Independent variables

FDI： is an investment made by a firm or individual in one country into business interests located in another country.

Fixed assets investment in the whole society: the workload of building and purchasing fixed assets activities in monetary terms.

Labor input: The amount of labor that a country can invest in production in a given period of time.

Chapter IV Findings

4.1 Research methods, model design and data

Based on the current various relevant measurement models, this paper intends to use Guangxi data for analysis and testing, and to determine the appropriate model to give a reasonable evaluation of the role of Guangxi's foreign direct investment. After repeating the regression operation for each model multiple times, and taking into account the availability of data, the following three steps are analyzed:

4.1.1. Analysis of the application of the expanded economic growth model

In this section, we are based on the basic explanatory variables of the endogenous economic growth model that has been widely used in empirical research. First we start with the following Cobb-Douglas production function equation:

$$GDP=F(DK,FDI,L) \quad (1)$$

The above formula can also be expressed as:

$$GDP=ADK^{\alpha}FDI^{\beta}L^{\gamma} \quad (2)$$

The logarithm of the two sides, the model (2) can be written as the following linear regression measurement model:

$$LnGDP=c + \alpha LnDK+\beta LnFDI+\gamma LnL+\mu \quad (3)$$

Among them, GDP is GDP, DK is domestic investment stock, FDI is foreign direct investment stock. (Because capital stock data is not available, we routinely use flow instead of stock, that is, the whole society fixed assets investment K minus foreign direct The investment is DK; and the US dollar is converted into RMB according to the official exchange rate), and L is the labor input (this article is based on the employees of the calendar year). C is the intercept estimated by the equation.

The coefficients α, β, and γ are the estimated elasticity of DK, FDI, and L growth for GDP growth, respectively. In theory, there will be a positive correlation between these variables, so these coefficients will take a positive value.

We hope that the regression of model (3) can provide a cornerstone for further finding the contribution rate and contribution of related factors.

4.1.2. Analysis using a multivariate lag distribution model

As a remedy, if the regression of model (3) is difficult to achieve the desired effect, we need to make changes to the model, through trial and error to finally obtain an effective regression model. After the selection of variables, and finally only the GDP and FDI variables, we intend to establish a q-order finite lag distribution model:

$$GDP=\alpha+\delta 0FDIt+\delta 1FDIt\text{-}1 +...+ \delta qFDIt\text{-}q+\mu t \quad (4)$$

Accordingly, we can establish a log-linear regression equation to analyze the supply and demand effects of foreign direct investment.

4.1.3. Unfolding Granger causality test

Linear regression can only determine the correlation between GDP and FDI, but it cannot determine the causal relationship between them. That is to say, the increase of FDI does not necessarily lead to economic growth. This causal relationship can be tested by the Granger no-causality analysis method.

In general, since the past cannot be predicted in the future, if the variable FDI is the variable GDP (Grange) reason, the change in FDI should precede the change in GDP. Therefore, when GDP is included in the regression of other variables (including its own past values), if the inclusion of past or late FDI values can significantly improve the prediction of GDP, it can be said that FDI is the Granger cause of GDP. Similarly, defining GDP is the Granger reason for FDI.

The Granger causality test assumes that information about the predictions of each variable of GDP and FDI is contained in the time series of these variables. The test requires an estimate of the following regression:

$$GDP_t = \sum_{i=1}^{m} \alpha_i FDI_{t-i} + \sum_{j=1}^{m} \beta_j GDP_{t-j} + \mu_{1t} \quad (5)$$

$$FDI_t = \sum_{i=1}^{m} \lambda_i FDI_{t-i} + \sum_{j=1}^{m} \delta_j GDP_{t-j} + \mu_{2t} \quad (6)$$

The interferences μ1t and μ2t are assumed to be irrelevant.

The procedure for using (5) to test that "FDI is not the cause of GDP change" is as follows: First, the current GDP is regressed for all lag GDP items, while the FDI lag term is ignored, and the constrained residual square sum and RSSR are obtained; The regression with the lag FDI term is obtained, and an unconstrained residual square sum RSSUR is obtained. The third is to propose the virtual hypothesis H0: Σαi=0, that is, the lag FDI term does not belong to this regression; the fourth is the F value constructed by (7) To test this hypothesis,
which is:

$$F = \frac{(RSS_R - RSS_{UR})/m}{RSS_{UR}/(n-k)} \quad (7)$$

It follows an F-distribution with degrees of freedom m and (n-k). Where m is equal to the number of lag FDI terms, k is the number of parameters to be estimated in the unconstrained regression; fifth is if the F value exceeds the critical value at the

selected significance level, then the virtual hypothesis is rejected, ie the lag FDI term is Belongs to this return. In other words, FDI is the Granger cause of GDP.

Repeat the above five procedures using (6) to test whether GDP is FDI or not.

Based on the above ideas, this paper will separately calculate and test the data of Guangxi Province, and give a scientific evaluation of the role of Guangxi foreign direct investment in Guangxi's economic growth. All data are from the "Guangxi Statistical Yearbook" of each year. The model can directly calculate the output by means of the economic analysis software EVIEWS 8.0.

4.2 Inspection of FDI and GDP data of Guangxi Province

4.2.1. Results of economic growth model and lag distribution regression model and their analysis

The statistics of FDI in Guangxi Province began in 2001. Three models were established using (3), (4) and their logarithmic forms. After the relevant variables were screened, the results were as follows:

Table 4.2.1 Regression results of the relationship between foreign direct investment (FDI) and gross domestic product (GDP) in Guangxi

Economic growth model		Finite lag distribution model			
I		II		III	
Explained variable	LOG(GDP)		GDP		LOG(GDP)
C	12.0428	C	-856.9876	C	4.1171
	(2.5244)		(-8.1127)		(38.6663)
LOG(LABOUR)	-1.2411	FDI	57.2756	LOG(FDI)	0.3637
	(-1.9647)		(7.1913)***		(8.8872)***
LOG(DK)	0.6812	FDI(-2)	32.5711	LOG(FDI(-3))	0.2025
	(30.8500)***		(5.8918)***		(9.7934)***
LOG(FDI)	0.0308	FDI(-5)	112.950		

	(0.5889)		(12.0197)*		
AD-R^2	0.9963	AD-R^2	0.9876	AD-R^2	0.9918
F	1363.596	F	266.7623	F	404.4055
Sample interval	2001-2016	Sample interval	2006-2016	Sample interval	2006-2016

PS:In the brackets in the table is t-statistic;***Indicates a significance level of 0.01;*Indicates a significance level of 0.10.

Source: Guangxi Statistical Yearbook for each year.

Model I is an economic growth model evolved from the Cobb-Glass production function. From the regression results, the adjusted R2 is above 99%, and the F value is much larger than the critical value of the significance level of 0.01, indicating that the overall linear level relationship of the model is significant. However, both the labor variable and the FDI variable have low t values and cannot pass the significance test. At the same time, the t value of the domestic investment variable passed the t test with a significance level of 0.01. In other words, the interpretation of GDP by domestic investment is still significant at 99%. The two variables t test in these three variables are not significant, so the coefficient obtained by this regression cannot be used to estimate the contribution rate (degree) of each variable to economic growth.

The possible explanation for this result is: First, compared with domestic investment, the contribution of foreign direct investment to economic growth is not significant, that is, the main driving force for economic growth in Guangxi is still domestic investment rather than foreign investment. Second, the labor force data is not significant due to the volatility of the model. Third, there may be large deviations in Guangxi labor force statistics. After comparative regression, it is found that the

regression coefficient of labor force on Guangxi's economic growth is either insignificant or even negative, which is far from the general theoretical analysis.

Model II is a multivariate lag linear regression between GDP and FDI. The results show that the model successfully passes the F test and the t test, so it has good explanatory power (the non-significant variables have been eliminated). The model shows that FDI, as an independent investment variable, not only constitutes the macroeconomic demand effect in the current year, but also forms a supply effect during the lag period. Specifically, for every $100 million in foreign direct investment, the demand effect of GDP growth of 5.728 billion US dollars will be brought to Guangxi in the same year; at the same time, the supply effect of GDP growth of 3.257 billion US dollars will be brought about two years later.

By the same token, from the logarithmic linear regression of model III, for every 1% increase in FDI, the demand elasticity effect of 0.36 % GDP growth will be brought in the same year, and the supply elasticity effect of 0.20% will be brought about three years later.

4.2.2. Analysis of the results of Granger causality test

Using the 2001-2016 data from Guangxi, follow the regression principle of (5), (6), and (7), and run the “Cause(i)” command in EVIEWS8.0, where i is the lag period and takes 1~ 4 respectively. . The test results are shown in Table 4.2.2.

From the Granger causality test results, the causal relationship between FDI and GDP in Guangxi has different causal relationships with different lag periods. In the lags 2, 3, and 4, all P values are less than 5%, rejecting the null hypothesis, indicating that the overall performance between FDI and GDP is a two-way causal relationship. In the first phase of lag, there is a one-way causal relationship between FDI and GDP, that is, FDI is the Granger cause of GDP, but GDP is not the Granger cause of FDJ change. When lags 5, FDI and GDP show a mutually independent relationship. This result indicates that, over time, FDI is the first reason for GDP growth, and then

becomes mutual influence, and finally moves toward independent relations, which is also a reflection of the time characteristics of FDI growth effects.

Table 4.2.2 Granger test results of causal relationship between FDI and GDP in Guangxi

Null Hypothesis	lags	F-Statistic	Prob.	Decision Making
FDI does not Granger Cause GDP GDP does not Granger Cause FDI	1	5.1723	0.03708	Refuse
		0.00131	0.9706	Accept
	2	5.4332	0.2197	Refuse
		15.2643	0.00052	Refuse
	3	5.4835	0.02013	Refuse
		4.5789	0.03254	Refuse
	4	6.1745	0.0258	Refuse
		4.8321	0.0438	Refuse
	5	1.6733	0.4515	Accept
		3.3306	0.1750	Accept

Note: The P value in this table is the probability value of the null hypothesis. The criterion is that when the saliency level is determined to be 5%, the null hypothesis is accepted when the probability value is greater than 5%, otherwise it is rejected.

Source: Guangxi Statistical Yearbook, each year.

4.3 The Mechanism of Foreign Direct Investment in Guangxi's Economic Growth

In order to fully understand the role of foreign direct investment in Guangxi's economic development, we incorporate foreign direct investment as an important variable of economic growth into the economic growth model, and compare it with the economic growth model parameters before the inclusion of the variable, and find that foreign direct investment is There are two roles in the economic growth and the spillover effect in Guangxi's economic growth. Then, using the Granger causality test to test the capital effect and spillover effect of foreign direct investment, the mechanism of foreign direct investment in Guangxi's economic growth process is obtained.

4.3.1 Economic growth model incorporating foreign direct investment variables

The economic growth model proposed by Solow in 1956 assumes a two-factor production function:

$$GDP = F(K, L) = AK^{T}L^{U} \qquad (1)$$

Where K is capital, L is labor, Y is output, and T and U are the output elasticity of capital and labor, respectively. It can be seen from equation (1) that in the Solow model, foreign direct investment and domestic capital are regarded as homogeneous elements into the capital variable K, and Solow does not take into account the impact of technological progress on output. In order to explain sustained economic growth,

external factors that increase factor productivity over the long term need to be considered. Therefore, the (1) formula incorporates the time factor, then:

$$GDP=F(K,L,t)= e^{Vt}K^{T}L^{U} \qquad (1.1)$$

In the formula (1.1), e is the base of the natural logarithm; t is the time; the other is the same as the definition of the formula (1). In fact, after the introduction of the time factor, factors such as technological progress, industrial structure changes, and institutional changes are all attributed to the time coefficient V. Therefore, e^{Vt} is called total factor productivity, and V is the growth rate of total factor productivity. Taking the logarithmic form of (1.1) and adding the random variable $\mathbf{u_t}$, you can get:

$$Ln(GDP_t)=Vt+TLn(K_t)+ULn(L_t)+u_t \qquad (1.2)$$

Using the relevant statistical data of Guangxi Economics since 2001 to estimate the model (1.2), the following estimation model can be obtained:

$$Ln(Y_t)= 0.0217t + 0.5920Ln(K_t) + 0.3028Ln(L_t)$$

$$(1.6673) \quad (3.1378) \qquad (1.8650)$$

AR(1)= 1.2830(T-Statistics 为 7.5614)

AR(2)= - 0.7755(T-Statistics 为-4.431)

R^2= 0.9880 D.W.= 1.4129

F= 622.567

Further, we can calculate the contribution of each factor to economic growth, and the calculation results are listed in Table 4.3.1.

Table 4.3.1 One of the results of economic growth in 2001-2016

	Technical Parameters	Contribution to economic growth(%)
Output growth rate(%)	9.534	100
Capital elasticity	0.5930	64.8
Labor flexibility	0.3019	8.9
Growth rate of total factor productivity	2.19	21.8

From the results of the estimation model (1.2), it can be clearly seen that the capital elasticity is much higher than the elasticity of the labor force, indicating that the contribution of capital increase to economic growth is much higher than the contribution of labor increase to economic growth. This result is basically consistent with the actual situation of the Guangxi economy. Guangxi is a province with a relatively large population in China. The labor force is relatively surplus, while the capital is relatively scarce. Therefore, the most important source of economic growth comes from the accumulation of capital accumulated by the increase of savings and investment (Han Tingchun, 2002). The growth rate of total factor productivity of the

Guangxi economy during this period was 2.19, which included the combined effects of industrial structure changes, institutional change effects and technological progress.

In fact, the model (1.2) assumes that domestic capital and foreign direct investment are not in conformity with the real economic conditions of Guangxi. Since the reform and opening up in 1978, the total capital used for investment in Guangxi has not only originated from the domestic market, but also a considerable part of it comes from foreign direct investment. The inflow of foreign direct investment brings advanced technology, management experience and institutional innovation in the investing countries. These intangible factors can be absorbed to a certain extent, thus affecting economic growth. Therefore, we cannot simply combine foreign direct investment with domestic capital as a homogeneous capital, but should use foreign direct investment as a variable that affects Guangxi's economic growth alone.

To simplify the analysis, it is assumed that domestic capital is homogeneous capital, that is, it can only be configured in the domestic form in the form of capital. Foreign direct investment flows in the international scope in the form of capital and technology. It is different from domestic capital and is a different kind of capital. We can define the total capital level of Guangxi as the weighted average of domestic capital and foreign direct investment. The mathematical form is specifically expressed as:

$$K = K_d^{\lambda} K^{1-\lambda} K_f \qquad (1.3)$$

Among them, K、K_d、K_f represent the total capital level of Guangxi, domestic capital and foreign direct investment, respectively, and λ indicates the weight of domestic capital in the total capital composition. After incorporating FDI as a production function input variable into the Cobb-Douglas production function, the model is as follows:

$$GDP = f(K^d, K^f, L, t) = e^{Vt}(K^d)^{T\lambda}(K^f)^{T(1-\lambda)} L^U \quad (1.4)$$

Take the logarithmic form and add the random variable to get:

$$Ln(GDP_t) = V_t + T_\lambda Ln(K^d_t) + ULn(L_t) + T_{(1-\lambda)} Ln(K^f_t) + u_t \quad (1.5)$$

Using the relevant statistical data of Guangxi Economics since 2001 to estimate the model (1.5), the following estimation model can be obtained:

$$Ln(GDP_t) = 0.0210_t + 0.5768Ln(K^d_t) + 0.3175Ln(L_t) + 0.0388Ln(K^f_t)$$

(0.4552) (1.8525) (1.1125) 1.9388

AR(1)= 0.4793(T-Statistics 为 2.1253)

MA(1)= 0.9523(T-Statistics 为 3.2375)

R^2= 0.9789 D.W.= 1.5791

F= 381.973

Further, we can calculate the contribution of each factor to economic growth, and the calculation results are listed in Table 4.3.2.

Comparing the model (1.2) with the model (1.5), it is found that after the introduction of the foreign direct investment variable K_f, the labor elasticity and its contribution to economic growth have not changed much; the capital elasticity has dropped from 0.5930 to 0.5779, and the contribution to economic growth has been 64.8. % fell to 51.7%; the growth rate of total factor productivity fell from 2.19 to 1.20, and the contribution to economic growth fell from 21.8% to 11.2%. The

contribution of foreign direct investment to economic growth comes from the reduction in the contribution of domestic capital and total factors to economic growth. This fully demonstrates that if foreign direct investment is included in the economic growth model as homogeneous capital of domestic capital, the contribution rate of foreign direct investment to economic growth will be underestimated. This actually proves that the assumption that domestic capital and foreign direct investment are not homogeneous capital is correct. As a part of Guangxi capital, foreign direct investment must have the attribute of capital. Its role in economic growth can be called the capital effect of foreign direct investment. At the same time, foreign direct investment is different from domestic capital. It has externalities and affects all factors involved in total factor productivity. This effect can be called the spillover effect of foreign direct investment.

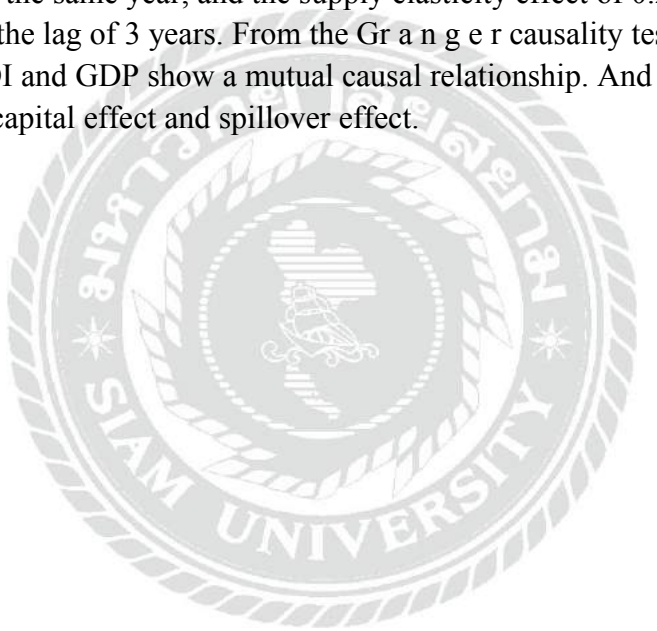
Table 4.3.2 Two of the results of economic growth in 2001-2016

	Technical Parameters	Contribution to economic growth(%)
Output growth rate(%)	9.534	100
Domestic capital elasticity	0.5779	51.7
Labor flexibility	0.3082	9.7

FDI flexibility	0.0390	17.4
Growth rate of total factor productivity	1.2000	11.2

Through the quantitative analysis and testing of empirical models, we can draw the following conclusions:

The contribution of foreign direct investment in Guangxi's economic growth, although secondary to the contribution of domestic capital, is still very important. According to estimates, for every 1% increase in FDI, the demand elasticity of 0.36% GDP growth will be brought in the same year, and the supply elasticity effect of 0.20% will be brought about by the lag of 3 years. From the Gr a n g e r causality test, it is found that Guangxi's FDI and GDP show a mutual causal relationship. And foreign direct investment has a capital effect and spillover effect.



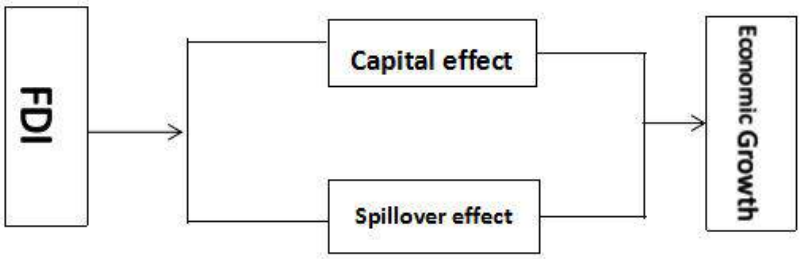
Chapter V Conclusion

5.1 Conclusions and implications

In general, although Guangxi FDI and economic growth are generally causal and causal, the positive role of Guangxi FDI in economic growth is still relatively small, and the level of opening up needs to be further improved; and foreign direct investment as a “package” of resources, not only It has capital attributes, promotes economic growth through direct capital effects, and indirectly leads to economic growth through China's domestic capital increase through industrial chain effects and demonstration and impact effects. At the same time, the inflow of foreign direct investment has an external effect, that is, an spillover effect. This is one of the main reasons for the change in total factor productivity. The general idea of Guangxi's use of FDI should be: expand Hong Kong, Macao and Taiwan, upgrade ASEAN, strengthen Japan and South Korea, expand Europe and the United States, build a new pattern of expanding foreign capital utilization, seize new opportunities for regional cooperation, and create a new high ground for international investment. So based on the conclusions of this study, we get the following revelation:

First, since the impact of foreign direct investment on Guangxi's economic development is in every respect, especially after the establishment of the China-ASEAN Free Trade Area, the use of foreign direct investment is not only a general open policy and development strategy, but also the realization of the world economy. Connected to participate in a global production division of labor. Therefore, we must continue to increase efforts to introduce foreign direct investment, make full use of the capital effect and spillover effect of foreign direct investment, in order to maintain the stable growth of Guangxi's economy at a certain speed.

Figure 5.1. The Mechanism of Foreign Direct Investment in Guangxi's Economic Growth Process



Second, the use of the China-ASEAN Free Trade Area to leverage the geographical advantages and natural resources of Guangxi to attract foreign investment. At this stage, ASEAN member states have become an important source of foreign direct investment in Guangxi. Guangxi and ASEAN can use each other's advantages. Guangxi not only has advantageous pillar industries, but also characteristic industries, and it is an important gateway and frontier for China to ASEAN. Therefore, ASEAN member countries can not only make profits from investing in Guangxi, but also open the door to the Chinese market through Guangxi.

5.2. Policy recommendations for attracting foreign direct investment in Guangxi

5.2.1 Establish a complete legal system

The status of foreign investment is crucial for attracting investment. The excellent investment environment is inseparable from sound foreign-related legal regulations, which are used to ensure the legitimate material benefits of foreign-funded companies and create an equal competitive environment for them. In 1987, the Guangxi government began to gradually build a relatively sound legal mechanism and built a foreign investment policy mechanism based on regional policies, financial policies, taxation policies, and preferential policies. First of all, improve the foreign-related legal mechanism and strive to have laws to follow.

Second, introduce relevant regulations to safeguard the legitimate rights and interests of foreign investors. Finally, enhance the maintenance of independent intellectual property rights.

In short, only by realizing that there are laws to follow, rules to follow, law enforcement to be strict, illegality to be investigated, and a fair, just, and open mechanism to be built can build an excellent investment environment and attract more foreign investment; We should follow the win-win principle. First, foreign-invested enterprises can make more profits by investing in Guangxi. Second, Guangxi attracts foreign direct investment to obtain sufficient capital, technology and scientific control to increase the growth of Guangxi's economy. . Therefore, we must improve the legal rules and regulations of foreign investment in Guangxi.

5.2.2 Optimizing the distribution pattern of FDI industry

Foreign direct investment has increased the extremely uneven situation of Guangxi's industrial structure. It is an unavoidable reality.

The information of the year shows that it reflects the common characteristics: foreign direct investment mainly moves to the secondary industry and slowly deviates from the primary and tertiary industries. The proportion of foreign capital inflows to the primary and tertiary industries has been decreasing year by year. Therefore, comprehensive guidance and integration of the industry layout of foreign direct investment is very crucial. Guangxi can introduce some preferential policies and relax the access policies of some industries in the primary and tertiary industries, and scientifically attract foreign direct investment to maintain the scientific proportion of the distribution of foreign direct investment industries and prevent adverse effects on Guangxi's national economy. Guarantee long-term and stable economic development.

5.2.3 Maintaining stable economic development

Actively develop the economy, maintain steady economic growth, and improve infrastructure construction. According to relevant information, foreign direct investment is more likely to flow to countries or regions with stable political situation and good economic development. If the economic growth of the host country is not stable, it will certainly dampen the enthusiasm of foreign investment. In addition, economic growth is closely related to water, electricity and transportation. The soundness of infrastructure has a major impact on the operating costs of foreign-funded enterprises and is a major consideration for foreign investors to investigate the economic environment of host countries.

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