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Discussion Paper

How does FDI affect the regional economic growth in China? Evidence from sub-regions and industries of the Jiangxi Province, P.R.China

SUMMARY: Using the latest panel data from 91 counties and 30 industries, we found that the FDI's impact is greatly limited geographically. The counties near the coastal provinces appear to be major beneficiaries. It is not true that the local industries with more FDI participation would bring more output. The impact of FDI has a bias on industries. So it cast doubt on the rationale of haphazard and lavish policies for FDI in too many industries in Jiangxi.

**How does FDI affect the regional economic growth in China?
Evidence from industries of the Jiangxi Province P.R.China**

SUMMARY:

Using the latest data from 30 industries in Jiangxi Province P.R.China, we found that it is not true that the local industries with more FDI participation would bring more output. So it cast doubt on the rationale of haphazard and lavish policies to compete for FDI in China. The impact of FDI has a bias on industries. It concentrated in only several sectors. Both the interconnection and the induced capacity are high in those sectors. So the supporting policies should focus on those industries.

Key words: Foreign Direct Investment, Regional Economy, Input-Output, Impact, China.

1. Introduction

Jiangxi is located in the middle of China, and it is one of the country's less developed provinces. In 2009, it had a population of 43.39 million, about 3.23% of the entire population of China. Its Regional Domestic Production (RDP) was RMB 7589.2 billion, only 2.26% of the national GDP. Exports and imports amounted to USD 13.6 billion, just 0.57% of the national amount. The RGDP per capita was only RMB 17490.66, which is 77.06% of the national figure.

Although Jiangxi is one of the country's less developed provinces, it has achieved rapid economic growth since the economic reforms were adopted by the Chinese Central Government in 1978. The Real Regional Gross Domestic Product of Jiangxi increased very quickly, from RMB 176.29 billion in 1978 to RMB 453.49 billion in 1995, with an average annual growth rate of 11.25%. However, from 1995 to 2003, the economic system transformed from a centralized economy to a market driven economy in Jiangxi. A large number of state-owned enterprises could not adapt themselves to market competition, and then bankrupted. Jiangxi faced internal economic pains in the period.

From 1997 to 2003, and it also suffer from the Asian economic crisis. After 1997, the Real RDP seemed to gain no growth in the period. Finally, from 2004 to 2008, the transformation of Jiangxi's economy seemed to come to an end, and the economy entered a steady development period. In this period, both foreign and domestic investment was very active. The Real RGDP increased quickly again from 2004, with an average annual growth rate of 3.42%.

The Jiangxi economy faced another problem: different levels of economic development between regions. The Real RDP of the North East region is clearly higher than other regions in Jiangxi between 2001 and 2008. This is because there are 3 industrial cities in the North East region. The South West meanwhile had the smallest RDP.

Due to policies, FDI was mainly concentrated in the coastal area at the end of the 20 century. Since the beginning of the 21 century, the coastal provinces have tried to upgrade their industries from low-tech and labor-intensive manufacturing to the high-tech, and environmentally-friendly manufacturing, or high-value-added services. Given these changes, the Government in coastal provinces raised the regulations for the lowest salary, and restricted environmental regulations. Then, more FDI companies moved from the coastal provinces to Jiangxi.

Besides, there are many reasons for FDI's entering in Jiangxi. Natural resources are abundant in Jiangxi. The region's infrastructure has progressed markedly since the end of 1990s. Moreover, in 2004, the Chinese Central Government began to make effect to

realize the economic raise in the middle part of China. The promotion policy for FDI's entering the middle parts was issued in the same year. So Jiangxi has absorbed a significant amount of FDI from USD 39.5 Million in 2001 to USD 3.6 billion in 2008.

2. THE OBJECTIVE OF THE STUDY

Although there are many studies which have found that FDI has a positive impact on economic growth in China (Wei 1995, Zhang 1995, Branstetter and Feenstra 1999), those studies are limited to the whole nation, or large regions of it. Few studies have been devoted to the analysis of the output effect of FDI on sub-regional economic growth, especially within a single province like Jiangxi. Furthermore, few studies have examined industrial levels.

The object of the study is to estimate the impact of FDI in both sub-regional and industrial levels. So, the research questions were set as follows: Which industries did FDI have a larger impact on? In which industries did FDI have a larger impact than Other Investment? And why was the impact of FDI so powerful in those sectors?

Due to the limitation of data, the studies will focus on the period between 2001 and 2008. As stated before, in that period, the Jiangxi economy was engaged in economic transformation. So we could analyze how FDI performed against the background of economic transformation.

3. Literature Review

There are a large number of literatures on impact of FDI on economic growth in recipient countries. Two different kinds of views are contrast to each other sharply: one believes in the positive impact while the other denies it. The evidence has been provided in many cases for both views.

For the views believing in the positive impact, the neoclassical theories suggest that FDI may be an engine of host economic growth. The reasons supporting a positive impact can be identified as follows: 1) FDI may have a positive effect on capital formation and employment (see *Solow, 1956, the case of USA*); 2) FDI may have a positive effect on manufacturing exports (see *Feder, 1982, the case of 6 Asian countries; Athukoral and Menon, 1995, the case of Malaysia; Zhang and Song, 2000, the case of China; Liu et al, 2001, the case of China; Xu and Wang, 2007, the case of China*); 3) FDI may bring technology and spillover effects (see *Romer, 1993, the case of 114 countries; We, 1995, the case of China; Balasubramanyam, Salisu, & Sapsford, 1996, the case of 46 developing countries; Borensztein, De Gregorio, & Lee, 1998, the case of 69 developing countries*,

Markusen & Venables, 1999, the case of 114 countries; Zhang, 2001, the case of China).¹

The other view is that the Marxist and dependency approaches may treat FDI as one mechanism for exploitation of, and gaining control over, developing countries by western industries. The reasons supporting a negative impact can be identified as follows: **1)** FDI might decrease the domestic savings and investment (see Papanek, 1973, the case of 34 countries for 1950s and 51 countries for 1960s; Cohen, 1993, the case of 81 developing countries; Reinhart & Talovi, 1998, the case of East Asian and Latin American Countries; Bornschier, 1980, the case of 90 Countries; Razin, et al, 1999, the case of 19 developing countries); **2)** FDI may decrease the foreign exchange earnings on both current account and capital account in the long-term. (see Singer, 1950, the case of Less Developing Countries; Weisskof, 1972, the case of 31 under developing countries); **3)** FDI may suppress or inhibit the development of local management skill and technologies (see Zhang, 2001, the case of China).²

In existing literature, the impact of FDI on individual sectors is studied by the Input-Output approach too. The Input-Output approach was developed by Wassily Leontief (1905-1999), and it uses a matrix representation of a nation's (or a region's) economy to predict the effect of changes in one industry on others and by consumers, government, and foreign suppliers. Finally, the impact of FDI could be expressed by the induced output of FDI.

In a specific case, Shri Prakash, Shalini Sharma and Faraji Kasidi (2008) used the Input-Output method to estimate the total and sectoral output effect of FDI on the Indian economy for the period 2003-2004. The model is as following,

$$X_t = (I - A_t)^{-1} F_t$$

$$X_t = (I - A_{t-1})^{-1} F_t$$

X_t is the gross output vector in the time t , $(I - A_t)^{-1}$ and $(I - A_{t-1})^{-1}$ is the Leontief inverse at time t and $t-1$, F_t is the FDI inflow vector in time t . They found that the sectors attracting FDI have a greater output effect than those who have not received any FDI. The maximum output effect of FDI is the Miscellaneous Manufacturing sector, while the minimum output effect of FDI is the printing and publishing sector.

Bruno de Souza Lopes, (2009) also used the Input- Output method to analyze the

¹ The arguments for positive economic effects of FDI are: (a) Inward FDI may enhance capital formation and employment augmentation. (b) FDI may promote manufacturing

² The economic arguments for the negative effects of FDI are: (a) FDI might lower domestic savings and investment. (b) In the long-term FDI may reduce foreign exchange earnings on both current and capital accounts. (c) Management know-how, and technology provided by MNC's, may suppress or inhibit developing local sources of scarce skills and resources, due to foreign dominance in the host country (Zhang 2001).

structure of both FDI and domestic investment, and compared their impact on production and jobs across 38 Brazilian business sectors, for the years 2000-2005. The model is as following:

$$X_t = (I - A_t)^{-1} F_t$$

Here, X_t is the gross output vector in the time t , $(I - A_t)^{-1}$ is the Leontief inverse at time t , F_t is the FDI inflow vector in time t . He found that FDI became more efficient in terms of increased production in the quickest time; FDI had the most dramatic effect in the service sectors. The results showed the significant impact of FDI on production and jobs.

4. The Methodology and Data

4.1 the Methodology

In this chapter, the FDI's impact in industries is analyzed by the Input-Output methodology based on 30 industries' FDI and Other Investment inflow data. The input and output equilibrium equation (Equation 3) is the basement of the Input-Output methodology. It means the gross output is the summary of all intermediate output and final demand (this mainly refers to consumption, investment, and Government expenditure).

$$AX + FD = X \quad (1)$$

Here, A is the matrix of input and output coefficients, X is the gross output matrix, and FD is the final demand matrix. AX is the intermediate output matrix.

In reality, there are both imports and exports. So, considering this situation, the Equation 3 could be rewritten more specifically:

$$X = AX + FD + E - M \quad (2)$$

Here, the M is the matrix of imports. E is the matrix of exports. Then the Eq-7 could be rewritten in the induced output type, like this:

$$X = [I - (I - M^{\wedge})A]^{-1} [(I - M^{\wedge})FD + E] \quad (3)$$

The M^{\wedge} is the diagonal matrix of import's ratio to total output, the $[I - (I - M^{\wedge})A]^{-1}$ is the revised Leontief inverse matrix. Then we divide final demand into three parts: FDI, Other Investment (OI) and Other³. Then Equation 5 could be rewritten as follows:

$$\begin{aligned} X &= [I - (I - M^{\wedge})A]^{-1} [(I - M^{\wedge})(FDI + OI + Other) + E] = [I - (I - M^{\wedge})A]^{-1} (I - M^{\wedge})FDI + \\ & [I - (I - M^{\wedge})A]^{-1} (I - M^{\wedge})OI + [I - (I - M^{\wedge})A]^{-1} (I - M^{\wedge})Other + [I - (I - M^{\wedge})A]^{-1} (I - M^{\wedge})E \\ &= X^{FDI} + X^{OI} + X^{Other} + X^E \quad (6) \end{aligned}$$

³ Other includes consumption and government expenditure.

Now the gross output matrix can be divided into 4 parts: the induced output⁴ of FDI matrix (X^{FDI}), the induced output of Other Investment matrix (X^{OI}), the induced output of Other matrix (X^{Other}), and the induced output of Export matrix (X^E).

So the induced output model of FDI could be written down, as below:

$$X_t^{FDI} = [I - (I - M^A)]^{-1} (I - M^A) FDI_t \quad (4)$$

Here, t is the time, the X_t^{FDI} is the induced output vector at the time t , and t is between 2002, 2005 and 2008. The FDI_t is the FDI inflow vector at the time t .

Here, we stress that x_{FDI}^{j-t} is the element of X_t^{FDI} . It has this relationship:

$$x_{FDI}^{j-t} \in X_t^{FDI} \quad (5)$$

Following Prakash's, et al. (2008) and Bruno's et al. (2009) approaches, the x_F^{j-t} means the output induced by the total FDI for a certain sector. In other words, it is the impact of FDI in a certain industries at time t . Furthermore, it could be illustrated as the output of other sectors, which are finally used as the input of sector j .

The limitation of the model is obvious - there is only one revised Leontief inverse matrix. So it cannot account for the change of the economic structure. The induced output vectors calculated by the model are assumed to isolate the technology effect on output. So the x_F^{j-t} between 2001 and 2008 capture only the change of FDI inflow in the industries.

From the Equation 6, we can see that the X_t^{FDI} is reflected by both the FDI's amount and the Leontief inverse matrix. Actually, the Leontief inverse matrix could be explained by both the forward linkage coefficient and backward linkage coefficient. The forward linkage coefficient and backward linkage coefficient is a pair of coefficients to express the interconnection effect between sectors. The forward linkage coefficient is used to indicate interconnection between a particular sector, and those to which it outputs. It can measure how much output could be induced by a particular sector, when all other sectors increase one more unit of output. It is a kind of inducement productivity. This is the forward linkage coefficient:

$$FWD_j = \sum_i^{30} b_{ij} / N, \text{ where } N = \sum_i^{30} \sum_j^{30} b_{ij} / 30 \quad (6)$$

Here, b_{ij} is the element of the Leontief inverse matrix, N is a constant, it is a constant and equal to the mean of sums of row vector of the Leontief inverse matrix. If the FWD_j is larger than 1, it means it is larger than the average level.

The backward linkage coefficient is used to indicate to interconnection between a particular sector and those from which it buy inputs. It can measure how much output

⁴ According to *Shri Prakash, Shalini Sharma and Faraji Kasidi (2008)*, the induced output is also called the output effect.

could be induced by a particular sector when it increases one unit final usage. The model of the backward linkage coefficient is as following:

$$BWD_j = \sum_j^{30} b_{ij} / N, \text{ where } N = \sum_i^{30} \sum_j^{30} b_{ij} / 30 \quad (7)$$

If the BWD_j is larger than 1, it means it is larger than the average level.

4.2 The Data

The data used for the sectoral analysis in this study is sourced from the Jiangxi Statistical Books of 2002-2009. The FDI inflow data is in value of USD, and the money base is different from each other. So it is adjusted with the Producer Price Indexes (PPIs) and the annual average exchange rate between USD and RMB. By those, the FDI in flow data is finally adjusted into the money base of 2002, which is suit for the 2002 Jiangxi Input and Output Table. The Total Investment data is in value of RMB, but the money base is different from each other. So it adjusted with PPIs to be on the money base of 2002 too.

For the PPIs in Jiangxi, the PPIs for specific sector are used in the study. However, there are only PPIs for specific sector, so the general PPI are used for the rest of sectors (see Appendix 1). The PPIs in Jiangxi are showed in the Appendix 2. From Appendix 2, we can see that the price change is rather great in Jiangxi.

The 2002 Jiangxi Input and Output Table is used in the study, and it was issued by the Jiangxi Statistic Bureau. It includes 42 sectors. By comparison, there are 30 sectors of FDI and Total Investment data in the Jiangxi Statistical Books. So we will combine some sectors from the 2002 Input and Output table, and link them with the FDI and Total data (See Appendix 3).

The FDI in 30 sectors are show in the Figure 1 between 2001 and 2008. From the Figure 1, it is seen that the highest amount is the ELECTRIC EQUIPMENT AND MACHINERY of FDI RMB 1.847 billion in 2008; the lowest is the PUBLIC ADMINISTRATION AND OTHER SECTORS of zero amount for 8 years. According to the amount, 3 groups could be identified from the Figure: High, Middle and Low. From the Figure 1, it is seen that FDI has a bias for sectors. **Firstly**, it is seen that the FDI has an obvious bias on the manufacturing sectors in the High group. Besides ELECTRIC EQUIPMENT AND MACHINERY, there are 5 industries in the High group, as following: the OTHER⁵, REAL ESTATE, WEARING APPAREL, LEATHER, FUR, DOWN AND

⁵ Other Sector is a combination of Sectors with smaller amount of FDI. As Appendix 1 shows, the sector of Other includes 6 sectors in the 2002 Input and Output Tables, as follows: the PAPER AND PRODUCTS, PRINTING AND RECORD MEDIUM REPRODUCTION sector, the OTHER MANUFACTURING PRODUCTS sector, the SCRAP AND WASTE, METAL PRODUCTS sector, the INSTRUMENTS, METERS,

RELATED PRODUCTS, and ELECTRONIC AND TELECOMMUNICATION EQUIPMENT. 3 of them are manufacturing sector, 1 of them are service sectors, the OTHER is relative with both manufacturing and service. **Secondly**, it is seen that FDI has no obvious bias on sectors in the Middle group. In the Middle group, there are contains 7 manufacturing sectors and 6 service sectors. **Thirdly**, it is seen that FDI has certain bias on service sectors in the Low group. In the Low group, there are 4 manufacturing sectors and 7 service sectors, the service sectors are obviously more than the manufacturing sectors. **Finally**, the gaps of amount are great among High, Middle and Low groups, especially the gap between High group and Low group is obviously great. So it is seen that FDI has had a bias for sectors generally.

[Here Insert Figure 1: the Foreign Direct Investments in Jiangxi]

5. Empirical Result

5.1 The induced output of FDI

The Figure 2 shows the induced output of FDI between 2001 and 2008. From the Figure 2, it is seen the Impact of FDI could be classified in to 3 groups according to amount too: High, Middle and Low. The amount of High group is significant larger than that of the Middle and Low groups, especially, the gap between the High group and Low group is huge. It suggests that the impact of FDI is limited within some certain sectors. In another word, the impact of FDI has a bias on the industries obviously. The Feature of each groups are stated as following:

1. The High Group. The impact of FDI is seemed to be concentrative in the group. Although the High group of induced output contains only 4 industries, but the proportion of those sectors increased from 33.02% in 2001 to 48.01% in 2008. The sector with highest amount is ELECTRIC EQUIPMENT AND MACHINERY, which is only rank 1 in the FDI amount too. Besides, the WEARING APPAREL, LEATHER, FUR, DOWN AND RELATED PRODUCTS is one of major industries for export in China, the OTHER is relative with both manufacturing and service sector, the AGRICULTURE, FORESTRY, ANIMAL HUSBANDRY AND FISHERY is just a big industries in Jiangxi`s Economy, about average 15.6% of RDP between 2001 and 2008. Among those industries, the manufacturing industries take a majority proportion.

CULTURAL AND OFFICE MACHINERY sector, and the TRAVEL AGENCY, TOUR OPERATOR AND TOURS GUIDE SERVICES sector.

2. The Middle Group. The Middle group contains 13 industries, 6 of them are manufacturing industries, and others are service industries. Those manufacturing industries include typical manufacturing sectors in Jiangxi, such as ELECTRONIC AND TELECOMMUNICATION EQUIPMENT, TEXTILES, MANUFACTURE OF FOOD PRODUCTS AND TOBACCO PROCESSING, TRANSPORT EQUIPMENT, and GENERAL AND SPECIAL PURPOSE MACHINERY. However, it is interesting that there are 7 service industries in the group. It suggests that the impact of FDI do not mainly limited within manufacturing sectors, since those service are engaged with a wide range, such as, REAL ESTATE, OTHER SOCIAL SERVICES, WHOLESALE AND RETAIL TRADE SERVICE, RENTAL AND BUSINESS SERVICES, ACCOMMODATION AND FOOD SERVING SERVICES, COMPUTER SERVICE AND SFOTWARE;

3. The Low Group. the Low group contains 13 industries too, 7 of them are service industries, 6 of them manufacturing industries. Unlike the feature of Low group of FDI inflow, the Low group of induced output has not a bias for sectors.

In general, the induced output of FDI has a bias on the industries obviously. the bias is mainly referring to 4 the manufacturing or agriculture sectors. However, there are not obvious biases for manufacturing sectors within the Middle or Low group. Besides, it is seen that the impact of FDI only decreases in 4 sectors, as following: REAL ESTATE, OTHER SOCIAL SERVICES, ACCOMMODATION AND FOOD SERVING SERVICES and OTHER, majority is service industries. It suggests that impact of FDI has a decreasing trend in service sectors in Jiangxi.

[Here Insert Table 1: the induced output of FDI, the FDI amount, the forward linkage coefficient and backward linkage coefficient]

The Table 5 shows the induced output of FDI, the FDI amount, the forward linkage coefficient and backward linkage coefficient. From Table 1, it suggests as following:

1. It is not true that the industries with more FDI participation would bring more output. From the Table 1, it is seen that the induced output of FDI is reflected by the FDI amount, the forward linkage coefficient and backward linkage coefficient. In general, the industries with both the interconnection effect and FDI amount would have high induced output of FDI. It suggests that the impact of FDI in those industries is the common result of FDI participation and interconnection effect. So it is not true that the more FDI inflow is, the more induced output is. For example, there are 4 industries with normal

amount or high amount, but with a low amount of induced output of FDI, those industries are as following: NON METALLIC MINERAL PRODUCTS, ELECTRICITY, STEAM, GAS AND WATER PRODUCTION AND SUPPLY, TRANSPORT, STORAGE AND POST and EDUCATIONAL SERVICES. And WHOLESALE AND RETAIL TRADE SERVICE has the amount of induced output but with low amount of FDI. Since many local governments in China would like to attract more FDI in the hope of bring more impact, the competition for FDI is serious now. So the result cast doubt on the rationale of haphazard and lavish policies to compete for FDI in China.

2. It seems that the impact of FDI concentrates in the sectors with strong interconnection. From Figure 2, it is seen that there are 3 industries with both high FDI amount and strong interconnection effect, as following: AGRICULTURE, FORESTRY, ANIMAL HUSBANDRY AND FISHERY, WEARING APPAREL, LEATHER, FUR, DOWN AND RELATED PRODUCTS and OTHER. Besides, there are 9 industries with strong interconnection effect and normal FDI amount inflow. Then those 12 industries take a proportion of FDI inflow are 49.8%, 55.68% and 52.49% in 2002, 2005 and 2008, and they take a proportion of induced output of FDI for 61.78%, 69.00%, 52.49% correspondently. So it is seems that FDI prefers to concentrate in those industries, and the interconnection effect of those industries are strong, so the induced output in those industries are high. In another word, the FDI seems to maximize its impact. The strong interconnection means demand or supply a lot to other industries, *Javorcik(2008)* stress that the spillover effect of FDI would like to take in the forward linkage and backward linkage. So it might that the spillover effect would like to exist in those industries in Jiangxi.

5.2 Compared with Other Investment.

Due to the large gap between the Induced Output amount of FDI, and Other Investment, it is hard to compare them. In order to do this, we will introduce the concept of the induced coefficient. It shows how much output can be induced when adding one more unit of Investment, under a certain type of sector ratio structure. Generally, it indicates the ability of output effect. The equation is:

$$\begin{aligned} ic_{FDI}^{j,t} &= x_{FDI}^{j,t} / fdi^t \\ ic_{OI}^{j,t} &= x_{OI}^{j,t} / oi^t \end{aligned} \quad (8)$$

fdi^t and oi^t are the total annual FDI and Other Investment amount at time t. The $x_{FDI}^{j,t}$ and $x_{OI}^{j,t}$ are the induced output of FDI and Other Investment in sector j at the time t. The $ic_{FDI}^{j,t}$ and $ic_{OI}^{j,t}$ are the induced coefficients of FDI and OI in sector j at the time t.

$$dic^{j,t} = ic_{FDI}^{j,t} - ic_{OI}^{j,t} \quad (9)$$

Here, $dic^{j,t}$ is difference between induced coefficient of FDI and Other Investment.

If it larger than zero, it suggest that the induced capacity of FDI is stronger than that of Other Investment, ice versa.

[Here Insert Figure 3: The difference between Induced Coefficients of Foreign Direct Investments and Other Investment in Jiangxi]

The Figure 3 shows the difference between Induced coefficient of FDI and that of Other Investment, it is ordered by the descending amount of induced output of FDI. It is seen as following:

1. The induced capacity of FDI is higher in some sectors with high or middle impact of FDI. From the Figure 3, it is seen that all sectors in the High group of impact of FDI has relatively higher induced capacity than Other Investment. Besides, there are 4 sectors in the Middle group too. So there are 8 sectors with obvious larger induced capacity of FDI than that of Other Investment, as following: ELECTRIC EQUIPMENT AND MACHINERY, AGRICULTURE, FORESTRY, ANIMAL HUSBANDRY AND FISHERY, OTHER, WEARING APPAREL, LEATHER, FUR, DOWN AND RELATED PRODUCTS, ELECTRONIC AND TELECOMMUNICATION EQUIPMENT, CONSTRUCTION, OTHER SOCIAL SERVICES, and MANUFACTURE OF FOOD PRODUCTS AND TOBACCO PROCESSING.

2. Among the 8 sectors mentioned above, the induced capacity of FDI has an increasing trend only in 4 sectors, as following: ELECTRIC EQUIPMENT AND MACHINERY, AGRICULTURE, FORESTRY, ANIMAL HUSBANDRY AND FISHERY, WEARING APPAREL, LEATHER, FUR, DOWN AND RELATED PRODUCTS, and ELECTRONIC AND TELECOMMUNICATION EQUIPMENT. All those sectors are within or closed to the High group of impact of FDI.

Since we have already found that both the interconnection and the induced capacity are high in sectors with high impact of FDI, it suggests that FDI would have a higher impact on economic growth in those sectors than other. Since the FDI is limited resource in China, it would be better to promote more available FDI to engage with those sectors. However, this suggestion is base on the fact that the FDI take a rather low proportion of Investment in Jiangxi (less than 15%), so the FDI's bias would not lead to the serious unbalance of industries. And FDI would be supposed to bring a spillover effect on those sectors.

6. CONCLUSION & POLICY RECOMMENDATION

This paper analyzes how FDI affects the regional economic growth in China, and provides evidence from industries of Jiangxi Province P. R. China between 2001 and 2008. The latest data of 30 industries are used. By employing the Input-output methodology, we found as following:

The sector with largest impact of FDI is ELECTRIC EQUIPMENT AND MACHINERY, which is only rank 1 in the FDI amount too. Besides there are 3 sectors in the High group of the impact of FDI too: the ELECTRIC EQUIPMENT AND MACHINERY, WEARING APPAREL, LEATHER, FUR, DOWN AND RELATED PRODUCTS, the AGRICULTURE, FORESTRY, ANIMAL HUSBANDRY AND FISHERY and OTHER. Among those industries, the manufacturing industries take a majority proportion.

It is seen that the impact of FDI has a bias on those sectors obviously. However, there are not obvious biases for manufacturing sectors within the Middle or Low group. Besides, it suggests that impact of FDI has a decreasing trend in some service sectors in Jiangxi, as following: REAL ESTATE, OTHER SOCIAL SERVICES, ACCOMMODATION AND FOOD SERVING SERVICES and OTHER,

Although, the FDI amount is the main reason for impact of FDI, but it is not true that the industries with more participation would bring more output. The forward linkage coefficient and backward linkage coefficient also affect the impact of FDI greatly. It cast doubt on the rationale of haphazard and lavish policies to compete for FDI in China.

The impact of FDI is preferred to concentrate in those industries with strong interconnection effects, so that impact of FDI seems to be high in those industries. The strong interconnection means demand or supply a lot to other industries, since the spillover effect of FDI would like to take in the forward linkage and backward linkage. So it might that the spillover effect would like to exist in those industries in Jiangxi.

The induced capacity of FDI is higher than that of Other Investment in 8 sectors which are in the High or Middle impact of FDI: ELECTRIC EQUIPMENT AND MACHINERY, AGRICULTURE, FORESTRY, ANIMAL HUSBANDRY AND FISHERY, OTHER, WEARING APPAREL, LEATHER, FUR, DOWN AND RELATED PRODUCTS, ELECTRONIC AND TELECOMMUNICATION EQUIPMENT, CONSTRUCTION, OTHER SOCIAL SERVICES, and MANUFACTURE OF FOOD PRODUCTS AND TOBACCO PROCESSING..Among those 8 sectors, 4 sectors, having the higher impact of FDI, have the increasing trends, while the rest do not. Those are: ELECTRIC

EQUIPMENT AND MACHINERY, AGRICULTURE, FORESTRY, ANIMAL HUSBANDRY AND FISHERY, WEARING APPAREL, LEATHER, FUR, DOWN AND RELATED PRODUCTS, and ELECTRONIC AND TELECOMMUNICATION EQUIPMENT.

Since both the interconnection and the induced capacity are high in sectors with high impact of FDI, it suggests that FDI would have a higher impact on economic growth in those sectors than other. Since the FDI is limited resource in China, it would be better to promote more available FDI to engage with those sectors. However, this suggestion is base on the fact that the FDI take a rather low proportion of Investment in Jiangxi (less than 15%), so the FDI's bias would not lead to the serious unbalance of industries.

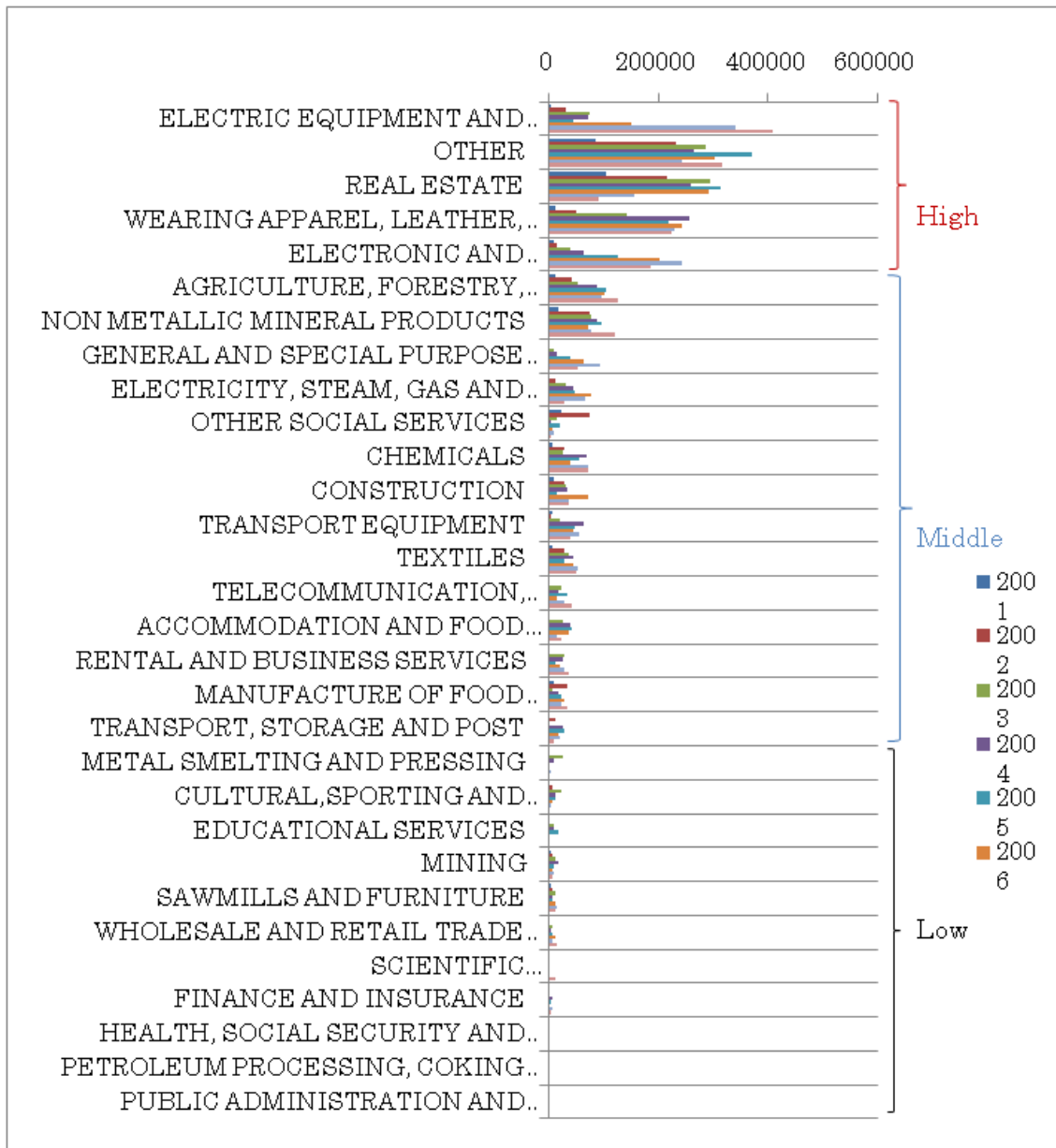
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Figure 1: The Foreign Direct Investments in Jiangxi

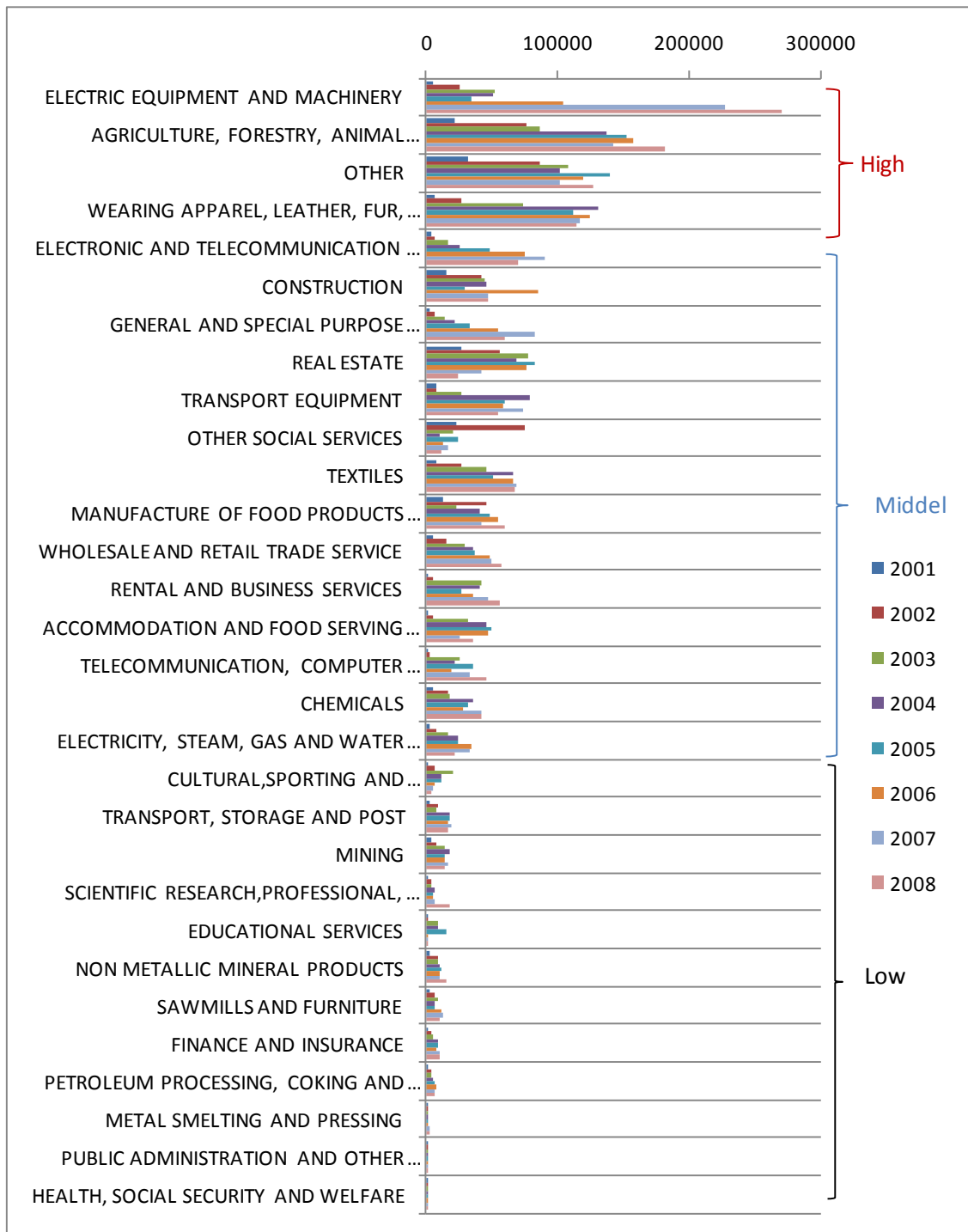
(Unit: RMB 10,000, on the money base of 2002)



Data Source: Jiangxi Statistical Books,

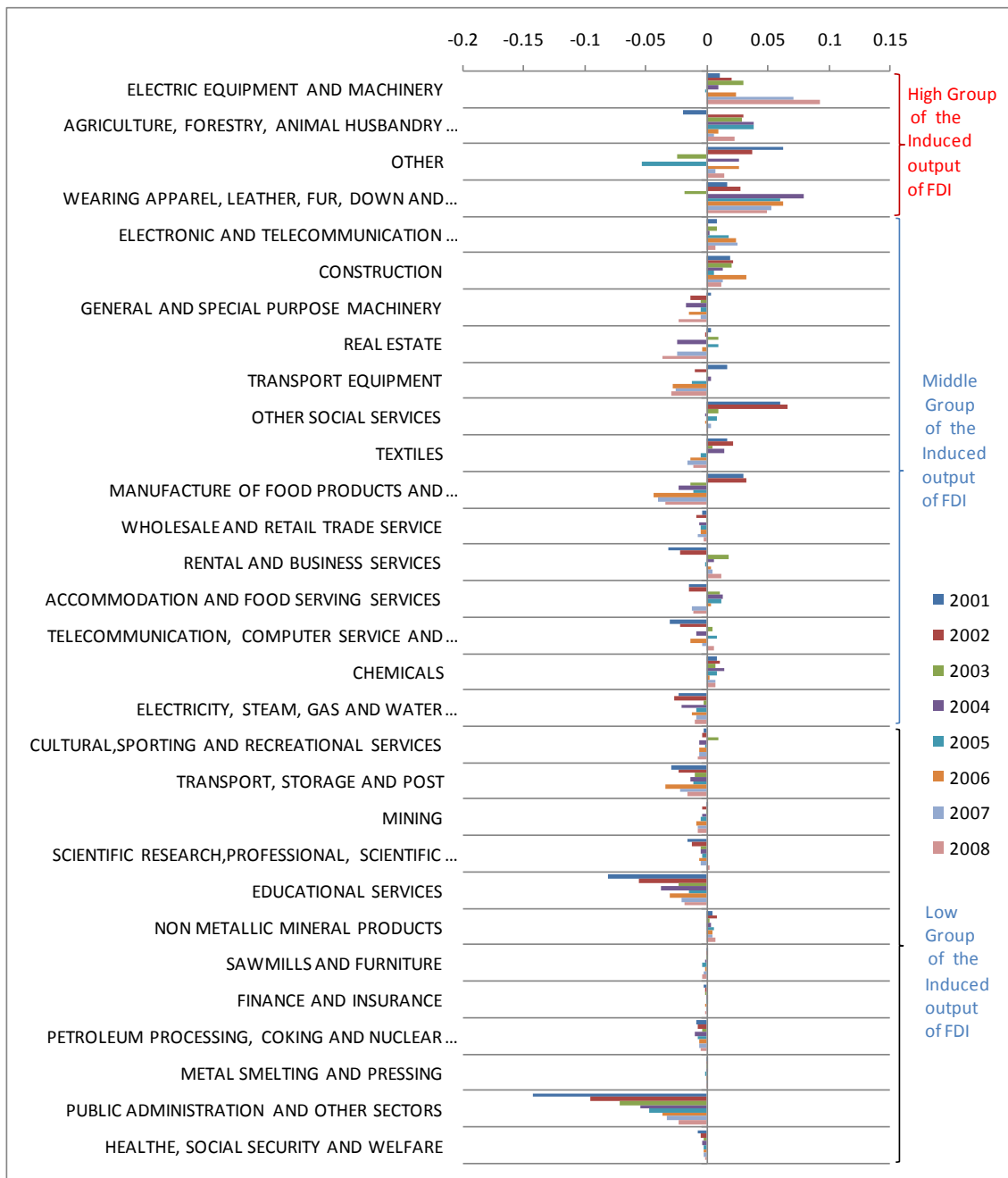
Figure 2: The Induced Output of Foreign Direct Investments in Jiangxi

(Unit: RMB 10,000, on the money base of 2002)



Data Source: Jiangxi Statistical Books,

Figure 3: The difference between Induced Coefficients of Foreign Direct Investments and Other Investment in Jiangxi
(The Induced Coefficient of FDI minus that of Other Investment, by the descending order of induced output of FDI)



Data Source: Jiangxi Statistical Books,

Table 1: The induced output of FDI, the FDI amount, the forward linkage coefficient and backward linkage coefficient

Sector	Induced Output Amount	FDI Amount	Forward Coefficient	Backward Coefficient
ELECTRIC EQUIPMENT AND MACHINERY	High	High	0.87	0.93
AGRICULTURE, FORESTRY, ANIMAL HUSBANDRY AND FISHERY	High	Middle	1.97	0.95
OTHER	High	High	1.09	0.94
WEARING APPAREL, LEATHER, FUR, DOWN AND RELATED PRODUCTS	High	High	0.79	1.17
ELECTRONIC AND TELECOMMUNICATION EQUIPMENT	Middle	High	0.83	0.94
CONSTRUCTION	Middle	Middle	1.10	0.95
GENERAL AND SPECIAL PURPOSE MACHINERY	Middle	Middle	1.12	0.96
REAL ESTATE	Middle	High	0.71	0.81
TRANSPORT EQUIPMENT	Middle	Middle	1.14	1.18
OTHER SOCIAL SERVICES	Middle	Middle	0.87	0.94
TEXTILES	Middle	Middle	1.09	1.21
MANUFACTURE OF FOOD PRODUCTS AND TOBACCO PROCESSING	Middle	Middle	1.17	1.36
WHOLESALE AND RETAIL TRADE SERVICE	Middle	Low	1.51	0.95
RENTAL AND BUSINESS SERVICES	Middle	Middle	1.35	1.19
ACCOMMODATION AND FOOD SERVING SERVICES	Middle	Middle	1.05	1.21
TELECOMMUNICATION, COMPUTER SERVICE AND SFOTWARE	Middle	Middle	0.92	0.91
CHEMICALS	Middle	Middle	1.05	1.00

ELECTRICITY, STEAM, GAS AND WATER PRODUCTION AND SUPPLY	Middle	Middle	1.04	0.89
CULTURAL,SPORTING AND RECREATIONAL SERVICES	Low	Low	0.84	0.96
TRANSPORT, STORAGE AND POST	Low	Middle	1.04	1.01
MINING	Low	Low	1.36	0.89
SCIENTIFIC RESEARCH,PROFESSIONAL, SCIENTIFIC AND TECHNICAL SERVICES	Low	Low	0.94	0.89
EDUCATIONAL SERVICES	Low	Low	0.69	0.89
NON METALLIC MINERAL PRODUCTS	Low	Middle	0.73	0.88
SAWMILLS AND FURNITURE	Low	Low	0.82	1.08
FINANCE AND INSURANCE	Low	Low	0.88	0.94
PETROLEUM PROCESSING, COKING AND NUCLEAR FUEL	Low	Low	0.93	1.10
METAL SMELTING AND PRESSING	Low	Low	0.71	0.94
PUBLIC ADMINISTRATION AND OTHER SECTORS	Low	Low	0.70	1.01
HEALTH, SOCIAL SECURITY AND WELFARE	Low	Low	0.71	0.94

Data Source: Jiangxi Statistical Books,

Appendix 1: The Usage of Sectoral Producer Price Index and General Producer Price Index

sector N.O.	Sectors	PPI Type
1	AGRICULTURE, FORESTRY, ANIMAL HUSBANDRY AND FISHERY	General PPI
2	MINING	The PPI of Coal Industry and Coking Industry
3	MANUFACTURE OF FOOD PRODUCTS AND TOBACCO PROCESSING	The PPI of Food Industry
4	TEXTILES	The PPI of Textile Industry
5	WEARING APPAREL, LEATHER, FUR, DOWN AND RELATED PRODUCTS	The PPI of Tailoring Industry
6	SAWMILLS AND FURNITURE	The PPI of Others Industry
7	PETROLEUM PROCESSING, COKING AND NUCLEAR FUEL	The PPI of Petroleum Industry
8	CHEMICALS	The PPI of Chemical Industry
9	NON METALLIC MINERAL PRODUCTS	The PPI of Others Industry
10	METAL SMELTING AND PRESSING	The PPI of Metallurgical Industry
11	GENERAL AND SPECIAL PURPOSE MACHINERY	The PPI of Machine Building Industry
12	TRANSPORT EQUIPMENT	The PPI of Machine Building Industry
13	ELECTRIC EQUIPMENT AND MACHINERY	The PPI of Machine Building Industry
14	ELECTRONIC AND TELECOMMUNICATION EQUIPMENT	The PPI of Machine Building Industry
15	ELECTRICITY, STEAM, GAS AND WATER PRODUCTION AND SUPPLY	The PPI of the PPI of Power Industry
16	CONSTRUCTION	The PPI of Building Materials Industry
17	TRANSPORT, STORAGE AND POST	General PPI
18	TELECOMMUNICATION, COMPUTER SERVICE AND SFOTWARE	General PPI
19	WHOLESALE AND RETAIL TRADE SERVICE	General PPI
20	ACCOMMODATION AND FOOD SERVING SERVICES	General PPI

21	FINANCE AND INSURANCE	General PPI
22	REAL ESTATE	General PPI
23	RENTAL AND BUSINESS SERVICES	General PPI
24	SCIENTIFIC RESEARCH, PROFESSIONAL, SCIENTIFIC AND TECHNICAL SERVICES	General PPI
25	OTHER SOCIAL SERVICES	General PPI
26	EDUCATIONAL SERVICES	General PPI
27	HEALTH, SOCIAL SECURITY AND WELFARE	General PPI
28	CULTURAL, SPORTING AND RECREATIONAL SERVICES	General PPI
29	PUBLIC ADMINISTRATION AND OTHER SECTORS	General PPI
30	OTHER	General PPI

Data Source: Jiangxi Statistical Books, Summary by author

Appendix 2: the PPIs in Jiangxi

PPIs	2001	2002	2003	2004	2005	2006	2007	2008
General	1.02	1.00	1.04	1.14	1.24	1.36	1.45	1.54
Metallurgical Industry	1.06	1.00	1.10	1.44	1.74	2.13	2.36	2.51
Power Industry	1.00	1.00	0.96	0.96	1.00	1.07	1.09	1.11
Coal Industry and Coking Industry	0.90	1.00	1.04	1.35	1.69	1.73	1.88	2.44
Petroleum Industry	1.09	1.00	1.17	1.33	1.64	1.89	1.96	2.32
Chemical Industry	1.02	1.00	1.01	1.04	1.11	1.15	1.19	1.31
Machine Building Industry	1.02	1.00	1.00	1.00	1.00	1.03	1.07	1.08
Building Materials Industry	1.00	1.00	1.04	1.12	1.04	1.07	1.14	1.27
Timber Industry	1.03	1.00	0.96	0.98	1.01	1.03	1.06	1.11
Food Industry	1.01	1.00	1.01	1.07	1.08	1.08	1.13	1.20
Textile Industry	1.09	1.00	1.08	1.18	1.17	1.21	1.21	1.25
Tailoring Industry	1.00	1.00	1.03	1.03	1.04	1.09	1.17	1.19
Leather Industry	1.05	1.00	1.00	1.05	1.05	1.05	1.09	1.15
Paper Industry	1.01	1.00	0.98	0.98	1.01	1.02	1.04	1.09

Industry of Cultural, Educational & Handicrafts Articles	1.02	1.00	0.94	0.93	0.93	0.93	0.93	0.94
Others Industry	0.94	1.00	1.02	1.04	1.10	1.15	1.18	1.21

Data Source: Jiangxi Statistical Books,

Appendix 3: The Combination of Sector between Jiangxi 2002 Input-Output table and Jiangxi Statistical Books

sector N.O.	The sectors of Jiangxi 2002 IO table (the original IO sectors)	The sectors of Jiangxi Statistical Books (the adjusted IO sectors)
1	AGRICULTURE, FORESTRY, ANIMAL HUSBANDRY AND FISHERY	AGRICULTURE, FORESTRY, ANIMAL HUSBANDRY AND FISHERY
2	MINING AND WASHING OF COAL	MINING
	EXTRACTION OF PETROLEUM AND NATURAL GAS	
	METAL ORE MINING	
	NONE-METAL MINERALS MINING	
3	MANUFACTURE OF FOOD PRODUCTS AND TOBACCO PROCESSING	MANUFACTURE OF FOODS
4	TEXTILES	TEXTILE
5	WEARING APPAREL, LEATHER, FUR, DOWN AND RELATED PRODUCTS	WEARING APPAREL, LEATHER, FUR, DOWN AND RELATED PRODUCTS
6	SAWMILLS AND FURNITURE	SAWMILLS AND FURNITURE
7	PETROLEUM PROCESSING, COKING AND NUCLEAR FUEL	PETROLEUM PROCESSING, COKING
8	CHEMICALS	CHEMICALS
9	NONMETALLIC MINERAL PRODUCTS	NONMETALLIC MINERAL PRODUCTS
10	METAL SMELTING AND PRESSING	METAL SMELTING AND PRESSING
11	GENERAL AND SPECIAL PURPOSE MACHINERY	GENERAL AND SPECIAL PURPOSE MACHINERY
12	TRANSPORT EQUIPMENT	TRANSPORT EQUIPMENT
13	ELECTRIC EQUIPMENT AND MACHINERY	ELECTRIC EQUIPMENT AND MACHINERY
14	ELECTRONIC AND TELECOMMUNICATION EQUIPMENT	ELECTRONIC AND TELECOMMUNICATION EQUIPMENT
15	ELECTRICITY, STEAM AND HOT WATER PRODUCTION AND SUPPLY	ELECTRICITY, STEAM, GAS AND WATER PRODUCTION AND SUPPLY
	GAS PRODUCTION AND SUPPLY	
	WATER PRODUCTION AND SUPPLY	

16	CONSTRUCTION	CONSTRUCTION
17	TRANSPORT AND STORAGE	TRANSPORT, STORAGE AND POST
	POST SERVICES	
18	TELECOMMUNICATION, COMPUTER SERVICE AND SOFTWARE	INFORMATION TRANSMISSION, COMPUTER SERVICES AND SOFTWARE
19	WHOLESALE AND RETAIL TRADE SERVICE	WHOLESALE AND RETAIL TRADES
20	ACCOMMODATION AND FOOD SERVING SERVICES	ACCOMMODATION AND FOOD SERVING SERVICES
21	FINANCE AND INSURANCE	FINANCIAL INTERMEDIATION
22	REAL ESTATE	REAL ESTATE
23	RENTAL AND BUSINESS SERVICES	RENTAL AND BUSINESS SERVICES
24	SCIENTIFIC RESEARCH	SCIENTIFIC RESEARCH, TECHNICAL SERVICE AND
	PROFESSIONAL, SCIENTIFIC AND TECHNICAL SERVICES	GEOLOGIC PROSPECTING
25	OTHER SOCIAL SERVICES	OTHER SOCIAL SERVICES
26	EDUCATIONAL SERVICES	EDUCATIONAL SERVICES
27	HEALTH, SOCIAL SECURITY AND WELFARE	HEALTH, SOCIAL SECURITY AND WELFARE
28	CULTURAL, SPORTING AND RECREATIONAL SERVICES	CULTURE, SPORTS AND ENTERTAINMENT
29	PUBLIC ADMINISTRATION AND OTHER SECTORS	PUBLIC ADMINISTRATION AND OTHER SECTORS
30	PAPER AND PRODUCTS, PRINTING AND RECORD MEDIUM REPRODUCTION	OTHER
	OTHER MANUFACTURING PRODUCTS	
	SCRAP AND WASTE	
	METAL PRODUCTS	
	INSTRUMENTS, METERS, CULTURAL AND OFFICE MACHINERY	
	TRAVEL AGENCY, TOUR OPERATOR AND TOURS GUIDE SERVICES	