# The Impact of Foreign Direct Investment on the Urban-rural Income Disparity in Eastern China

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**ABSTRACT**

Under the guidance of China's reform and opening-up and the background of today's economic globalization, opening to the outside world has become one of China's economic development priorities. For eastern China with the highest opening degree, cities' actual use of foreign direct investment (FDI) is expanding, but the trend is gradually slowing down. The income gap among cities within the eastern China is still large, despite the fact that it is shrinking all the time. This paper uses the data of 12 regions in eastern China from 2005 to 2020 to empirically analyze the degree of the urban-rural income disparity (URID) in each region and the eastern China. The results show that FDI and the URID are in an "inverted U-shaped" relationship for the eastern region, and most of them are currently in a narrowing stage. By analyzing the contribution rate of each region to the overall URID in the east, it is found that the Guangxi Zhuang Autonomous Region has the greatest impact. Therefore, when reducing the income gap in eastern China, the Guangxi Zhuang Autonomous Region should be one of the priorities to raise the level of economic development.

***Keywords:*** *Urban-rural Income Disparity, FDI, Inverted U-shaped, Empirical Analysis.*

## 1. INTRODUCTION

According to the data from the National Bureau of Statistics, China's total imports and exports in 2020 reached US$4.655913 trillion, and the actual amount of foreign capital utilization reached US$144.3 billion, which is several times that at the beginning of reform and opening-up. Foreign direct investment (FDI) not only provides jobs for China, but also drives China's technological progress and economic development through technological spillovers and other means, and promotes the adjustment of China's industrial structure. Fang Yang (2022) showed that FDI has a significant role in promoting economic growth in different regions of China, among which the eastern region has the greatest impact due to factors such as policies and geographical locations [1]. But at the same time, with the development of the economy, the income gap between the rich and the poor in China is also widening. For a country, the rich-poor gap plays an important role in social development and social stability. Today, as one of the most populous countries in the world, there is no doubt that the rich-poor gap will affect the quality of life of the people and the stability of the country [2].

In terms of the urban-rural disparity, some researchers, such as Tian Liu [3], believe that FDI has no obvious influence. However, Feng He and Guilin Xu have proposed that FDI has a significant impact on the urban-rural income disparity (URID) [4]. At the same time, some researchers including Lifan Shi have proposed that FDI will indirectly affect the URID [5]. Many researchers have studied this from different angles, but few of them have made a specific analysis of a certain area. Therefore, this paper will conduct a further study on the impact of FDI on the interior of the eastern region, by using the panel data of 12 provinces, autonomous region and municipalities from 2005 to 2020. First, the paper analyzes the actual use of FDI and the income gap among regions in the eastern China. Secondly, it analyzes the impact of FDI on the URID of various regions in the eastern China. Finally, the author analyzes which region has the greatest impact on the overall URID in the eastern China through the contribution rate. This study helps to understand the relationship between FDI and URID in the eastern China, and acts as a reference for the balanced development of policies in the eastern China.

## 2. THE SITUATION OF REGIONS IN THE EASTERN CHINA

As a place attracting the most foreign investment in China, regions in eastern China also have a gap in their


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opening-up and the level of income. This paper includes 12 regions in the eastern China: Beijing, Tianjin, Hebei, Liaoning, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong, Guangxi Zhuang Autonomous Region, and Hainan. The following will explain the actual situation of the opening degree and income level of these regions in recent years.

### *2.1 Opening degree*

The opening degree of each region is measured by the actual use of FDI in each region. Table 1 shows the actual use of FDI in region in the eastern China in some years. It can be seen from Table 1 that the total actual use of FDI in the eastern China has shown an increasing trend, but the growth rate has gradually slowed down in recent years. The actual use of FDI has more than doubled from $71,701,250,000 in 2005 to $164,072,400,000 in 2020. It can be seen that the degree of opening to the outside world in the eastern China has increased significantly in the past 15 years. Most of the regions also showed the same trend, with the actual use of FDI growing steadily but with a slowing trend.

**Table 1.** The actual use of FDI by regions (unit: ten thousand US dollars).

| | 2005 | 2010 | 2015 | 2020 |
|---|---|---|---|---|
| Beijing | 352638 | 636358 | 1299635 | 1410441 |
| Tianjin | 332885 | 1084872 | 2113444 | 473536 |
| Hebei | 227890 | 436597 | 736884 | 1103000 |
| Liaoning | 359042 | 2075010 | 518516 | 1744000 |
| Shanghai | 685000 | 1112100 | 1845900 | 2023300 |
| Jiangsu | 1318339 | 2849777 | 2427469 | 2838387 |
| Zhejiang | 1393826 | 1322584 | 1696024 | 1578475 |
| Fujian | 260775 | 580279 | 768339 | 502347 |
| Shandong | 897072 | 916833 | 1630090 | 1764763 |
| Guangdong | 1236391 | 2026098 | 2687546 | 2533925 |
| Guangxi | 37866 | 91200 | 172208 | 131742 |
| Hainan | 68401 | 151212 | 200567 | 303324 |
| Total | 7170125 | 13282920 | 16096622 | 16407240 |

### *2.2 Income gap between cities*

This paper will use the relative income ratio as an indicator to measure the level of the income gap among regions to briefly analyze the situation. The specific expression is:

*Relative income = per capita disposable income of a region / the value of the region with the highest per capita disposable income per year*

Relative income is a relative indicator. The smaller the indicator value is, the lower the region's per capita disposable income (PCDI) and its ranking among all regions are compared to that of the highest region. In other words, the smaller the indicator value is, the larger the income gap among regions will be. On the contrary, when the value is larger, the region's PCDI is closer to that of the highest region, the rank is higher, and the income gap is smaller.

Table 2 lists the relative income ratios of 12 regions in the eastern China for some years. It can be seen from Table 2 that in the above four years, the value of Shanghai is 1, indicating that the PCDI of Shanghai residents is the highest in the eastern China. The second is Beijing. The values in Beijing are all greater than 0.9, indicating that the PCDI of Beijing and Shanghai are similar, and the gap between the two cities is small. The lowest value is in the Guangxi Zhuang Autonomous Region, with values less than 0.35 in all four years, indicating that the PCDI of residents in Guangxi is low, especially compared with Shanghai, the income gap between these two regions is large. However, it can also be seen from Table 2 that the annual minimum value is gradually rising. Although the magnitude is small, it can show that the gap is gradually narrowing.

**Table 2.** Relative income ratio.

| | 2005 | 2010 | 2015 | 2020 |
|---|---|---|---|---|
| Beijing | 0.950 | 0.960 | 0.972 | 0.961 |
| Tianjin | 0.578 | 0.633 | 0.627 | 0.607 |
| Hebei | 0.315 | 0.343 | 0.363 | 0.376 |
| Liaoning | 0.393 | 0.458 | 0.493 | 0.453 |
| Shanghai | 1.000 | 1.000 | 1.000 | 1.000 |
| Jiangsu | 0.491 | 0.559 | 0.592 | 0.601 |
| Zhejiang | 0.682 | 0.695 | 0.713 | 0.725 |
| Fujian | 0.453 | 0.479 | 0.509 | 0.515 |
| Shandong | 0.387 | 0.425 | 0.455 | 0.455 |
| Guangdong | 0.572 | 0.545 | 0.559 | 0.568 |
| Guangxi | 0.275 | 0.320 | 0.338 | 0.340 |
| Hainan | 0.300 | 0.340 | 0.381 | 0.386 |

## 3. METHODOLOGY

### *3.1 Variable selection*

For the convenience and accuracy of data, this paper uses the ratio of urban residents' disposable income to rural residents' net income to measure the income difference between urban and rural areas. The higher the value, the greater the URID.

As for the opening degree, this paper uses the ratio of actual FDI to the GDP of various regions as the basis. Considering the impact of different urban economic development levels on the URID, the per capita GDP of each region is used to represent the region's economic development level, so as to reduce the impact of region size and population on economic development. Through empirical analysis, Xiekui Zhang and Wei Huang (2022) put forward the mechanism of urban-rural integration

through constructing infrastructure and narrowing the URID [6]. Therefore, this paper takes the level of urbanization as one of the explanatory variables, and uses the ratio of the urban population to the total population of each region as the measurement basis.

### *3.2 Data collection*

The data in this paper are from the official website of the National Bureau of Statistics (NBS) and the websites of the statistical bureaus of various cities. The annual average exchange rate is from the official website of the World Bank. The descriptive statistics of different kinds of data are shown in Table 3.

**Table 3.** Statistical description of different data.

| | average | median | standard deviation | minimum value | maximum value | number of observations |
|---|---|---|---|---|---|---|
| urid | 2.490470435 | 2.483251049 | 0.296247498 | 1.845092522 | 3.374446086 | 192 |
| urban | 0.644204487 | 0.630053226 | 0.14821998 | 0.336266094 | 0.895833333 | 192 |
| pgdp | 57310.16667 | 49726.5 | 33460.11551 | 8069 | 164158 | 192 |
| pfdi | 0.035438508 | 0.027390068 | 0.025661229 | 0.001705252 | 0.120965263 | 192 |

### *3.3 Modeling*

According to the selection of the above variables, the following model is established:

$$\ln urid_{it} = \alpha + \beta_1 \ln pfdi_{it} + \beta_2 \ln pfdi^2{}_{it} + \beta_3 \ln pgdp_{it} + \beta_4 \ln urban_{it} + \varepsilon_{it}$$

URID is the explained variable, representing the urban-rural income disparity; pfdi is the main explanatory variable, representing the level of FDI in each region. At the same time, the pfdi2 is added to the model for research; pgdp represents per capita GDP; region represents the urbanization level of each region; i represents 12 different regions in the eastern China; t represents different years from 2005 to 2020; ε represents a random distractor.

## 4. RESULT AND ANALYSIS

### *4.1 City-by-city regression test*

By using Eviews software, the above model is used to perform a regression test on the data of each region.

**Table 4.** Influence coefficient of each explanatory variable in each region.

| City | β1 | β2 | β3 | β4 |
|---|---|---|---|---|
| Beijing | -0.0357 | -0.0069 | -0.0565 | 0.2172 |
| Tianjin | 0.0337 | 0.0064 | 0.6801 | -8.1052 |
| Hebei | -0.5255 | -0.0038 | -0.3997 | 0.8004 |
| Liaoning | -0.0094 | -0.0015 | 0.2934 | -2.0642 |
| Shanghai | -0.1512 | 0.0082 | -0.1350 | -1.6486 |
| Jiangsu | 0.1101 | -0.0029 | 0.2972 | -1.0189 |
| Zhejiang | 0.0099 | -0.0027 | -0.0041 | -0.5009 |
| Fujian | 0.0479 | 0.0020 | 0.1309 | -0.8995 |
| Shandong | -0.0709 | -0.0104 | 0.0135 | -0.6236 |
| Guangdong | -0.0478 | 0.0059 | -0.1200 | -0.7318 |
| Guangxi | 0.0346 | -0.0036 | 0.2701 | -1.5102 |
| Hainan | -0.0154 | -0.0013 | 0.0069 | -1.0218 |

Using the panel data of 12 regions from 2005 to 2020 for a total of 16 years, the impact of FDI, urbanization, and per capita GDP on the URID of each region is obtained. Because the situation of each region is different, the White test and LM test need to be carried out separately when performing the regression test. After testing and adjustment, the influence coefficients of each explanatory variable in each region on the URID are shown in Table 4.

#### *4.1.1 FDI*

In terms of FDI, it can be seen from Table 4 that 7 of the 12 regions have negative coefficients, which means in Beijing, Hebei, Liaoning, Shanghai, Shandong, Guangdong, and Hainan, the growth of FDI will narrow the URID within the region. For the remaining five regions: Tianjin, Jiangsu, Zhejiang, Fujian, and Guangxi, the coefficients are positive, so FDI will expand the URID within regions. Among them, the region with the largest positive impact is Jiangsu Province, with a coefficient of 0.1101, that is, when FDI increases by 1%, the URID within the region will expand by 0.1101%. Relatively, the largest negative impact is Hebei Province, with a coefficient of -0.5255, that is, when FDI increases by 1%, the internal URID will be narrowed by 0.5255%.

The explanation for the different effects of FDI on the URID in different regions can be analyzed from the following points. First, the geographical location of each region is different, and FDI has a role in reducing the URID, especially in the eastern coastal areas of China [7]. Secondly, it is related to surrounding cities. For example, Feng Dai and Xiaoyi Lv (2018) believed that while FDI

affects the URID in the city, it also affects surrounding cities [8]. Other factors affect each region, such as policies, technological development levels, and urban culture, which will all play a role.

In terms of the coefficient of the square term of FDI, except for a few regions with positive coefficients, the coefficients of most regions are negative, indicating that FDI has an “inverted U-shaped” relationship with the URID in most regions. It is consistent with the "inverted U-shaped curve hypothesis of the relationship between economic development and income gap change" put forward by Simon Smith Kuznets [9].

### *4.1.2 GDP per capita*

After the model regression, the influence coefficient of the per capita GDP of each region on the URID is shown in Table 4. It can be seen that the urban economic level has expanded the URID in some regions while reducing the URID in other regions. According to Xueliang Wu (2019), he mentioned that the relationship between economic growth and the URID is related to different development directions and strategies of regions [10]. For regions with rapid economic development, such as Tianjin, with the economic progress, the technology continues to innovate, and the requirements for employees are getting higher and higher, resulting in the elimination of some low-skilled personnel, which in turn will widen the income gap. For some regions with relatively slow development, they can take into account all aspects of development. In that case, the urban and rural areas can be more balanced, and the income gap between rich and poor will be narrowed.

### *4.1.3 Urbanization*

The degree of influence of the level of urbanization on the URID of a region is shown in Table 4. From the regression data, it can be seen that the coefficients of urbanization in other regions except for Beijing and Hebei Province are all negative, indicating that for most regions, the higher the level of urbanization, the narrower the URID.

## *4.2 Regression Test for Eastern Region*

First, the overall URID in the eastern China and the situation of each variable are analyzed by regression analysis, using the same model above. However, in the initial regression, DW=0.25, which was too small, indicating the existence of multicollinearity. After adding the first-order lag term AR(1), the multicollinearity of the model disappeared. The results obtained on this basis are shown in Table 5.

**Table 5.** Regression results for the eastern China.

| Variables | Coefficients | t-Statistic | Prob. |
|---|---|---|---|
| C | 1.1943 | 5.7296 | 0.00 |
| Log(pfdi) | -0.0944 | -2.1737 | 0.0310 |
| Log ( pfdi ) ^2 | -0.0104 | -1.9455 | 0.0532 |
| Log(pgdp) | -0.0542 | -2.9484 | 0.0036 |
| Log(urid) | -0.1792 | -2.8994 | 0.0042 |
| Adjusted R-squared=0.9059 | | F=366.7231 | |

Each explanatory variable has a significant effect at the significance level of 0.1, and the goodness of fit is high. From the overall situation in the east, FDI, the level of urbanization and economic growth will all reduce the URID, while the coefficient of the square term of FDI is negative, indicating that the overall FDI and the URID also have an “inverted U-shaped” relationship.

## *4.3 Contribution rate analysis*

The following is an analysis of the contribution rate of each region's explanatory variables to the eastern China. According to the definition of contribution rate: "as an indicator for analyzing economic benefits, it is the ratio of the number of effective or useful results to resource consumption and occupancy, that is, the ratio of output to input, or the ratio of income to cost." Therefore, the contribution rate formula in this paper is:

*Contribution rate = the value of each region / the overall value of the eastern China*

According to the above formula, the contribution rate of each region is calculated, and the results are shown in Table 6. As seen in Table 6, Guangxi Zhuang Autonomous Region has the lowest ratios in terms of FDI and per capita GDP and urbanization. Meanwhile, it has the largest value in URID. This is closely related to the level of economic development in the region. As of 2019, 46 poverty-stricken counties in Guangxi have been lifted out of poverty. Before that, the economic development of the region was relatively backward. Although it is located in the eastern coastal area, the degree of attracting foreign investment is much lower than that of other regions. So the Guangxi region has the lowest contribution rate among the explanatory variables.

Among the 12 regions, Tianjin has the smallest contribution rate to the URID, indicating that in the past 16 years in the eastern China, Tianjin has had the smallest URID. Besides, Tianjin has the largest contribution rate to urbanization. This is consistent with the previous regression analysis: The urbanization of Tianjin has a very obvious effect on narrowing the income gap between urban and rural areas. In terms of FDI, the two regions with the highest contribution rate are Beijing and

Shanghai, and the regions with the highest per capita GDP are also Beijing and Shanghai. It shows that these two regions have the highest level of economic development and the highest attraction for foreign investment. Therefore, to narrow the URID in the eastern China, regions with high contribution rates should be narrowed first, such as Guangxi Zhuang Autonomous Region and Guangdong Province. Through the above regression analysis and the example of Tianjin, one of the methods to narrow the URID can be obtained: To promote the development of urban-rural integration.

**Table 6.** Contribution rate.

| City | URID | FDI | GDP per capita | Urbanization |
|---|---|---|---|---|
| Beijing | 8.74% | 11.12% | 14.71% | 7.78% |
| Tianjin | 6.74% | 10.44% | 9.67% | 19.42% |
| Hebei | 8.35% | 6.26% | 4.52% | 4.31% |
| Liaoning | 8.77% | 8.43% | 5.76% | 13.21% |
| Shanghai | 7.75% | 11.52% | 14.39% | 10.18% |
| Jiangsu | 7.85% | 8.12% | 10.28% | 8.90% |
| Zhejiang | 7.17% | 8.23% | 9.19% | 8.25% |
| Fujian | 8.34% | 7.71% | 8.37% | 5.13% |
| Shandong | 8.55% | 6.94% | 6.63% | 5.35% |
| Guangdong | 9.33% | 8.73% | 8.11% | 6.39% |
| Guangxi | 9.91% | 5.71% | 3.67% | 1.40% |
| Hainan | 8.52% | 6.80% | 4.69% | 9.67% |

## 5. CONCLUSION

Through the above analysis of the situation and the contribution rate of the eastern China, as well as the regression tests conducted on the eastern regions and the eastern China, the following conclusions can be drawn:

First, the amount of actual use of FDI in the eastern China and each region has increased year by year, but at the same time, the trend is gradually slowing down. Second, by establishing relative income indicators, the income gap among regions in the eastern China can be measured. In the selected years, the region with the highest per capita income of residents in the eastern China is Shanghai, and the region with the lowest is the Guangxi Zhuang Autonomous Region. Although the income gap among regions has gradually narrowed in recent years, the gap is still large. Third, through the trend analysis of the overall FDI and URID in the eastern China, it can be seen that FDI will narrow the URID. In the overall regression test, the same results can be obtained. At the same time, the other two variables also hurt the overall URID. The coefficient of the square term is negative, indicating that FDI has an "inverted U-shaped" effect on the overall URID. Fourth, in the regression test by region, the situation of each region is different. FDI has narrowed the URID in seven of them and widened the other five. The reasons may be different geographical locations, different economic development conditions, the mutual influence among regions, interference from policies, and other factors. For most regions, the coefficient of the squared term of FDI is negative, which is the same as the overall effect, that is, an "inverted U-shaped" change. Fifth, in the analysis of the contribution rate of each region to the eastern China, it is found that the two regions with the best economic development are Beijing and Shanghai, and their FDI is among the best. The Guangxi Zhuang Autonomous Region, with poor economic development, has the lowest FDI contribution rate and the largest contribution rate to URID.

Finally, this paper also has shortcomings. First, the spatial effect among regions, which in other words, whether there is a transmission effect among regions, is not considered. Second, there is no clear division of FDI inflows into specific industries.

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